Workshop to review the proposed activities of the IATTC regional tuna tagging program 2019-2020
JANUARY 28-30, 2019, LA JOLLA

Tuna tagging programs undertaken by NRIFSFRL around Japan

By

NRIFSF, Okinawa Pref., Kagoshima Pref., Japan NUS, Miyagi Pref., Ajinomoto Co. Inc. and Taiwan FRI

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Outline

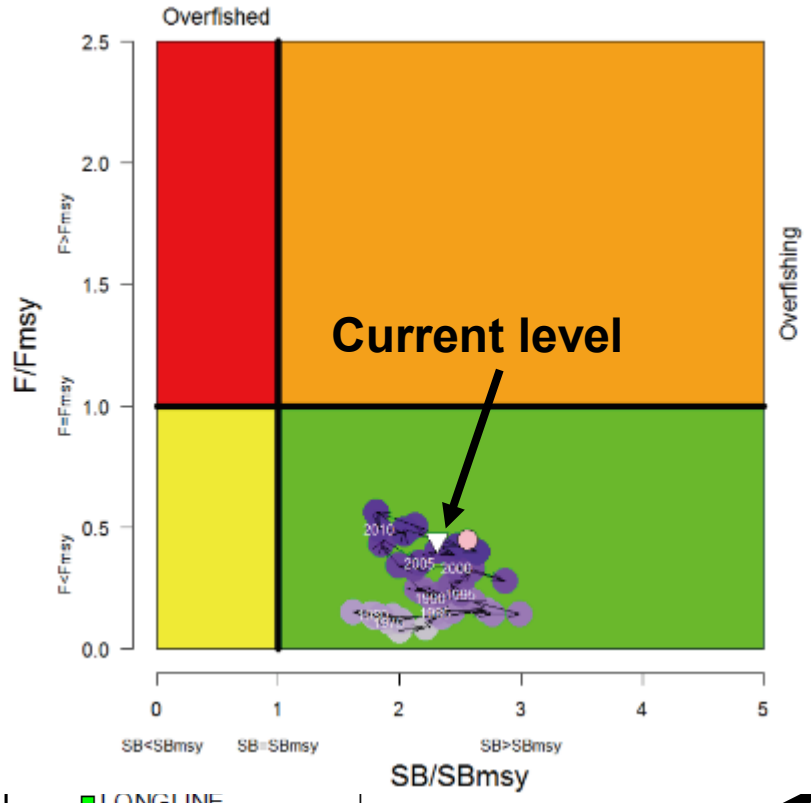
- Overview of SKJ tagging
- Overview of BET and YFT tagging
- Future outlook

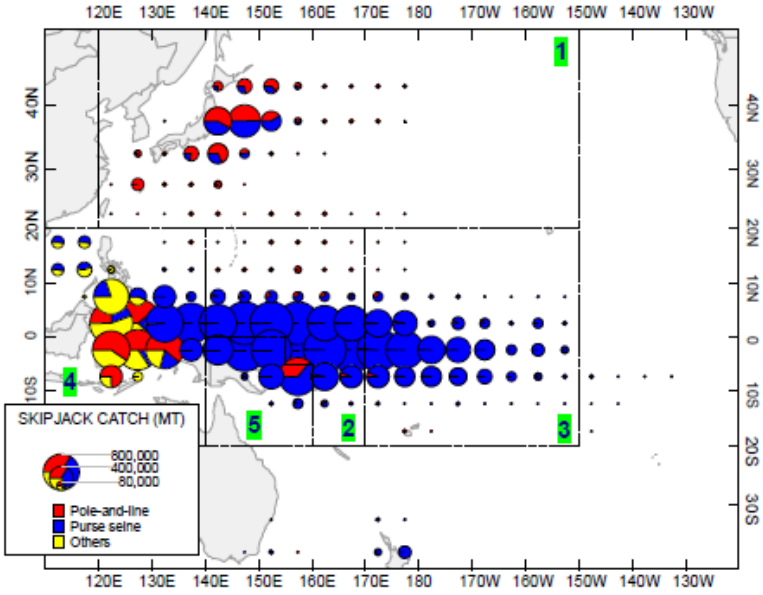
Overview of SKJ tagging

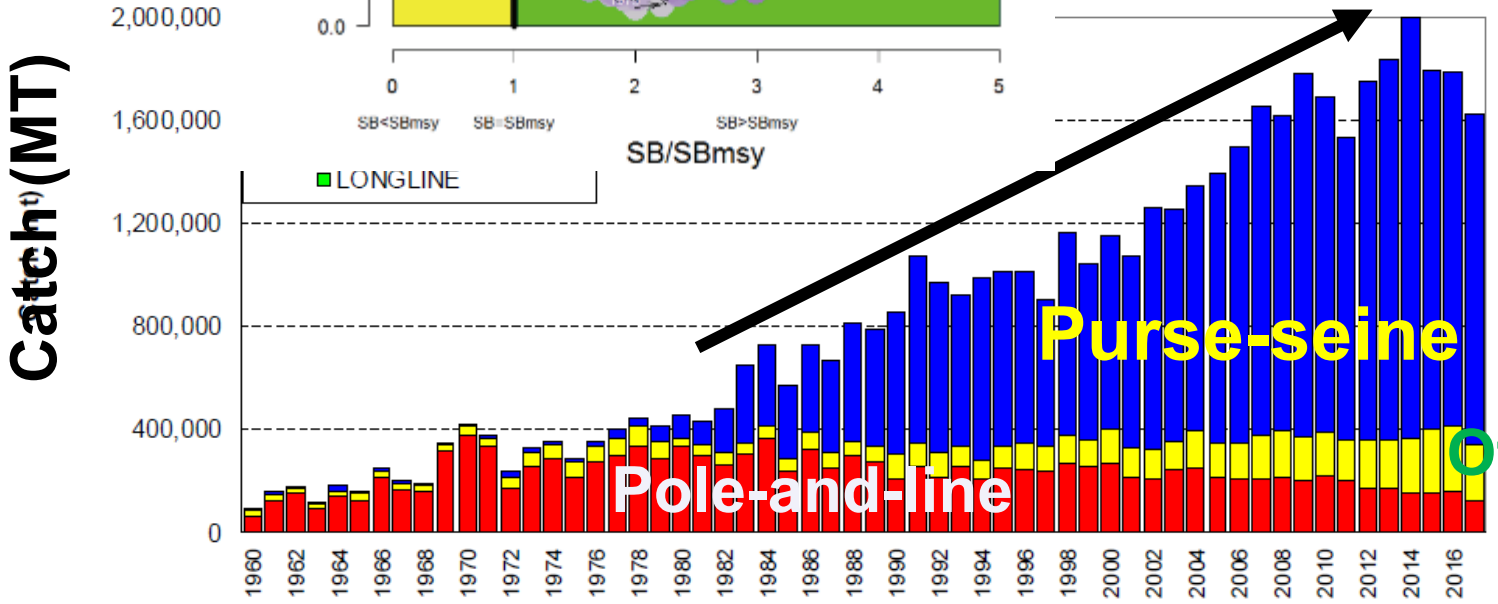
Backgrounds

- Northwestern Pacific Ocean including Japanese water (coastal and offshore areas) is one of main fishing grounds for SKJ (PS, PL, troll, etc).
- There is long history (since 1965) for SKJ tagging in wide area (from temperate to tropical area mainly in the WCPO).
- Since 2009, SKJ tagging has been conducted mainly to focus on investigating migration (route and mechanism) to Japanese waters, and tagging is mainly conducted in the subtropical area (including coastal area).

Status of skipjack tuna catch and stock in the western and central Pacific



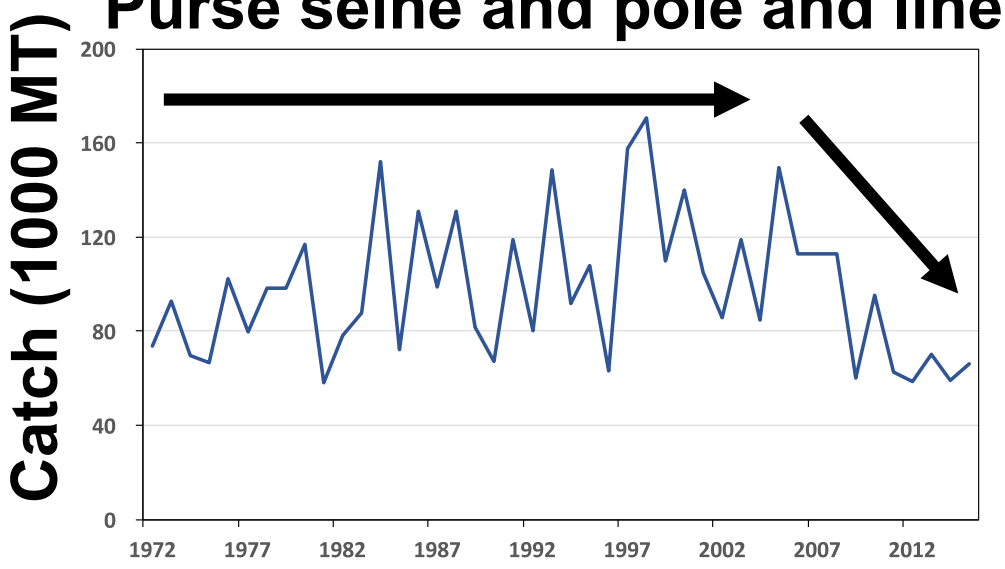


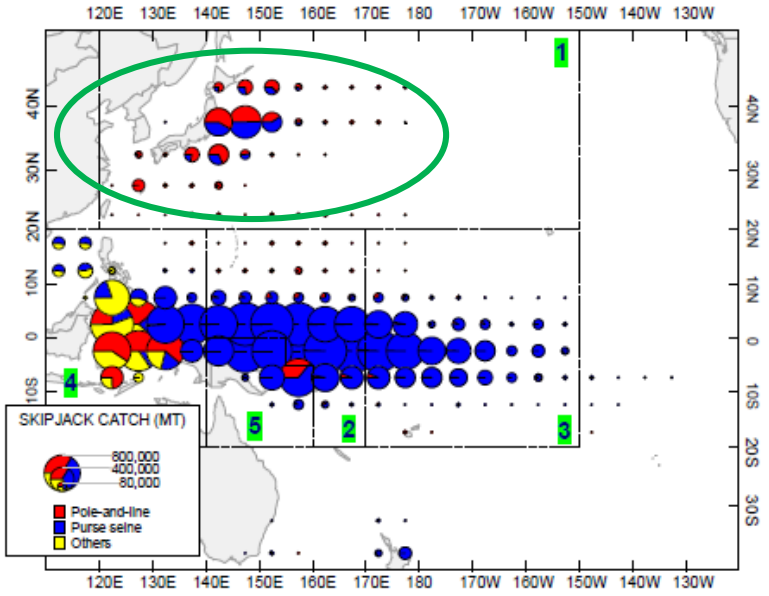


2017 catch 1,624,162 MT

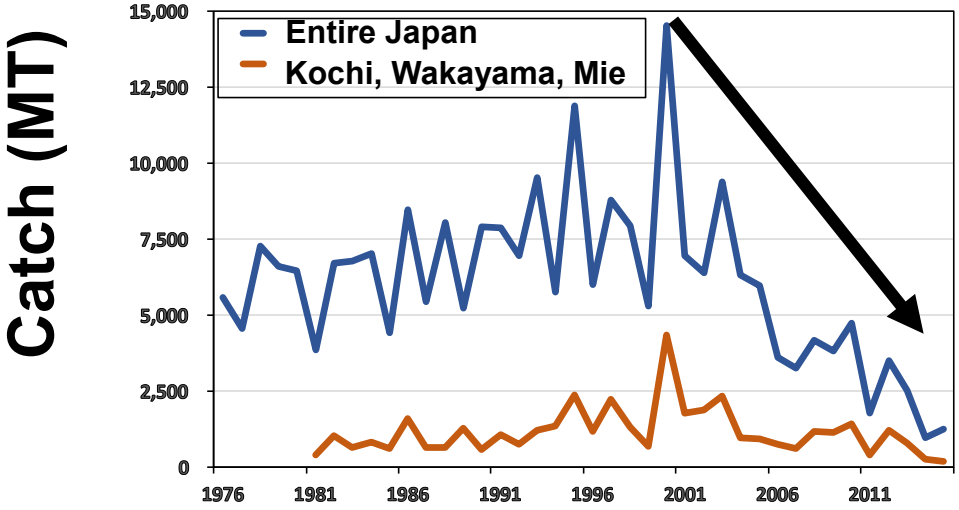
Status of skipjack tuna catch in the Japanese water

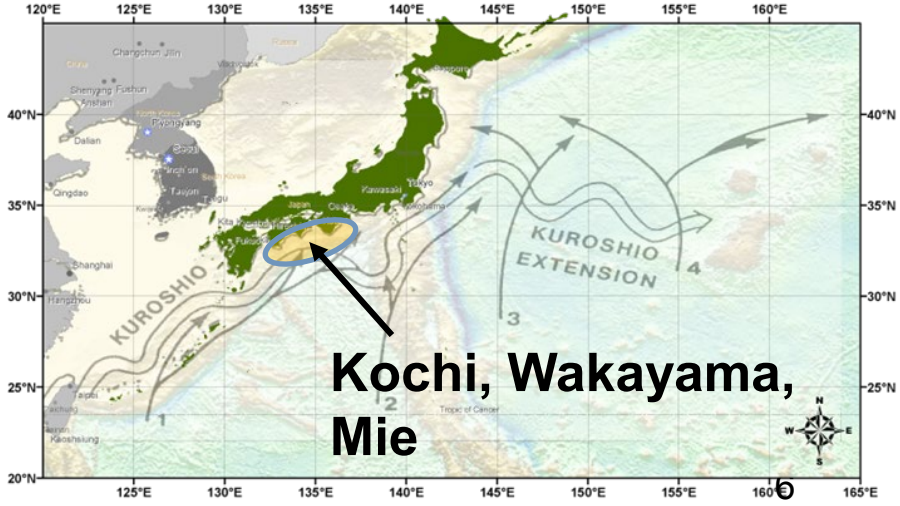
Purse seine and pole and line



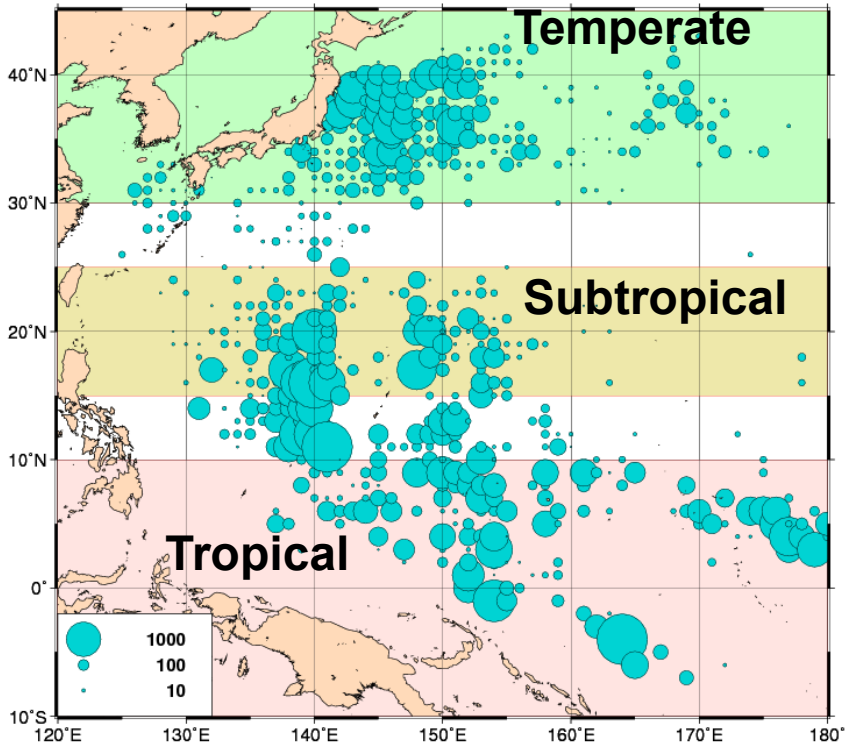


Coastal area (troll)





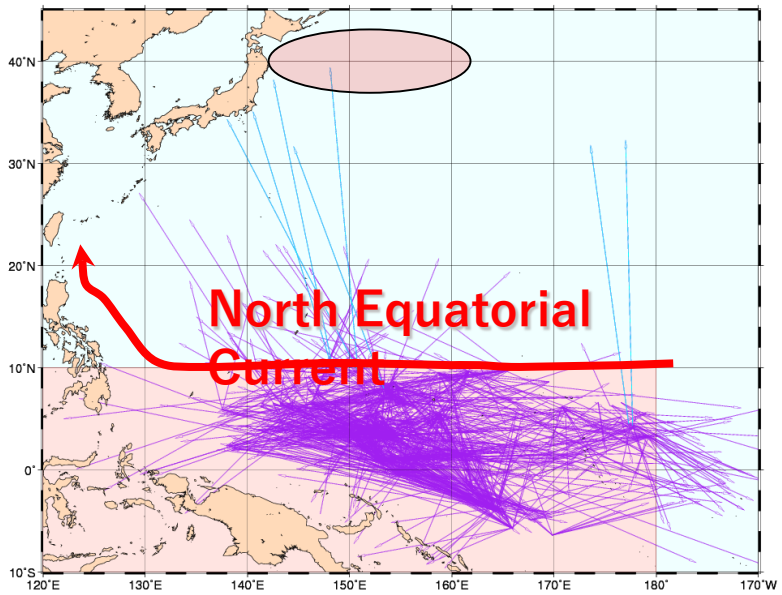
Summary results of SKJ tagging before 2009

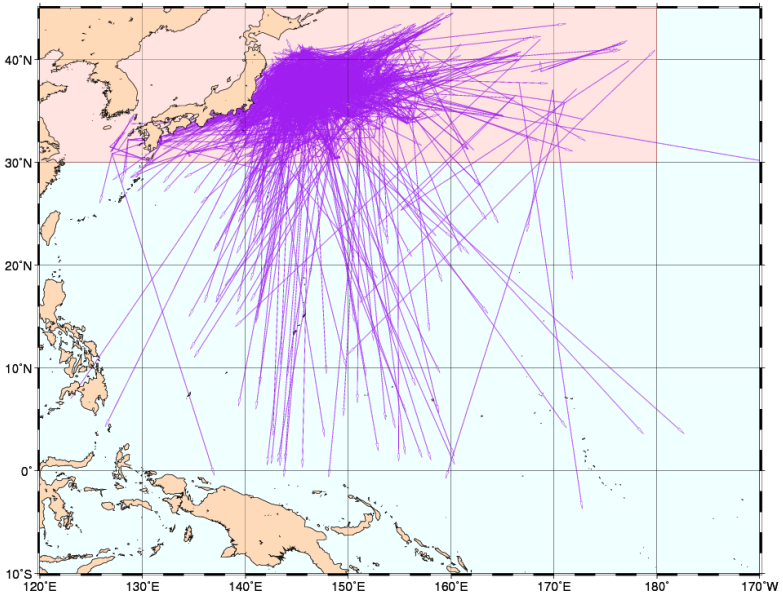


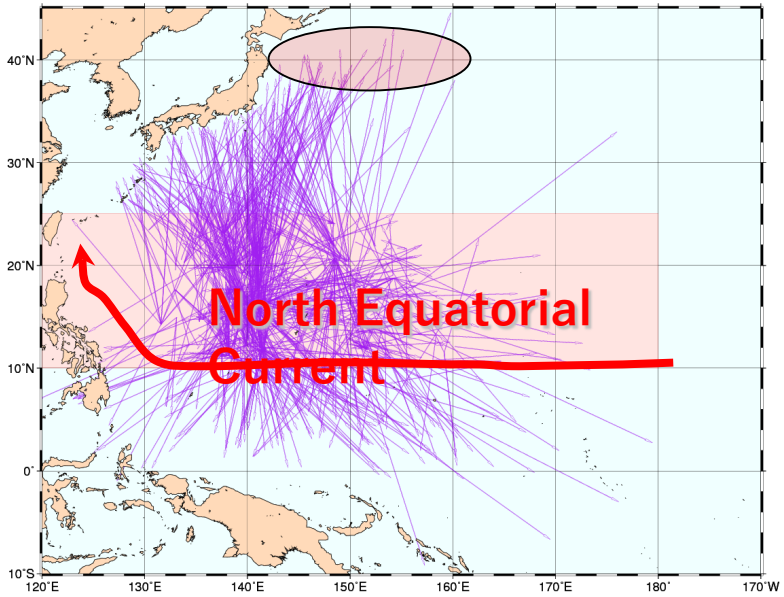
- The fish were released in a wide area.
- The fish were mainly caught and released by pole-and-line (research, training, chartered and commercial vessels).

Area	Tropical 10S–10N 120E–180	Subtropical 15–25N 120E–180	Temperate 30–45N 120E–180	Others	Total
Release	35,659	25,506	30,859	16,259	108,283
Recapture	2213	670	2612	527	6,022
% recaptured	6.2%	2.6%	8.5%	3.2%	5.6%

Movement from tropical (10S-10N) and subtropical (10-25N) and temperate (30-45N) area





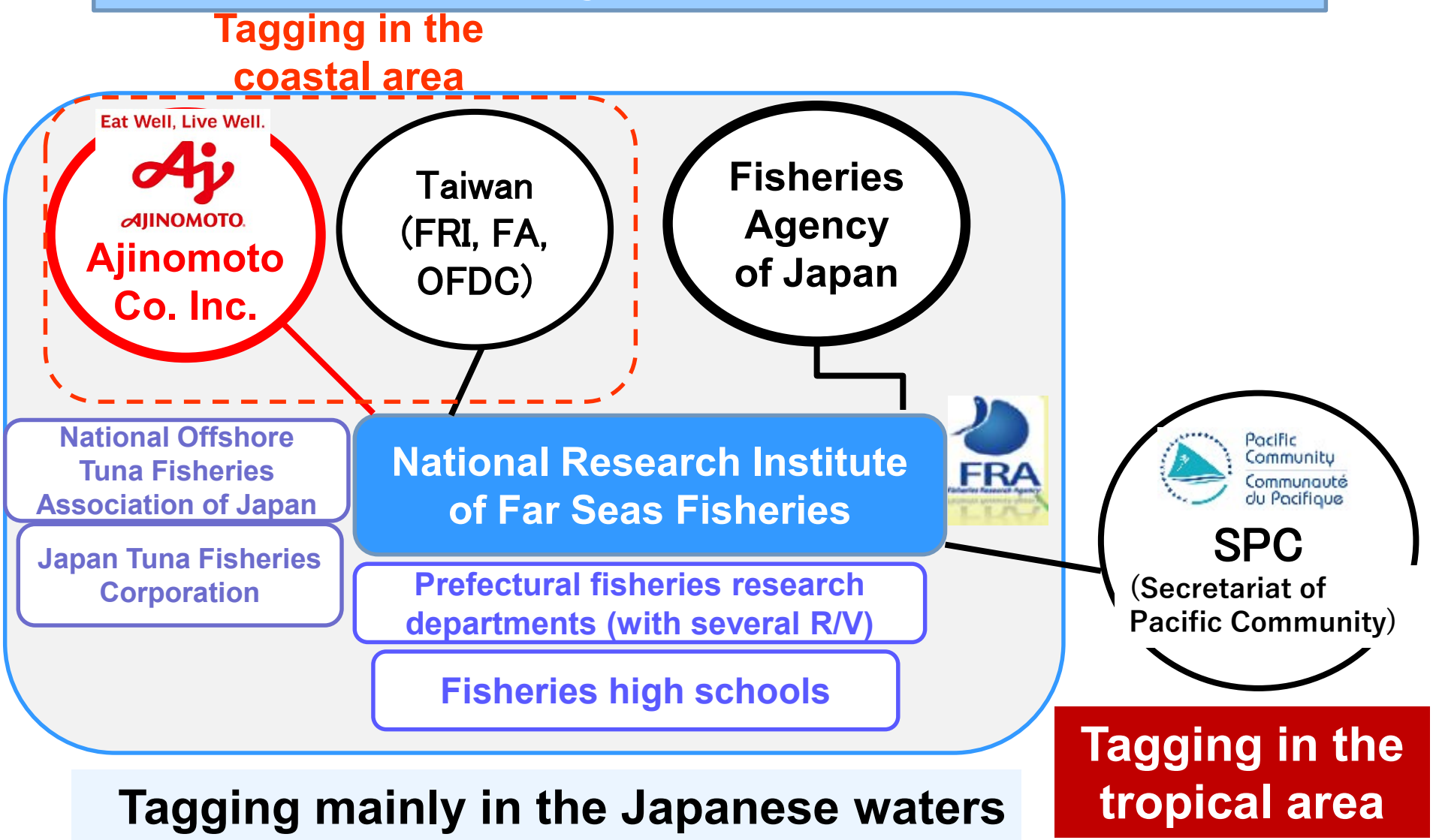


-Skipjack in the east off Japan
→ mainly from subtropical area (10-25N, north of North Equatorial Current)?

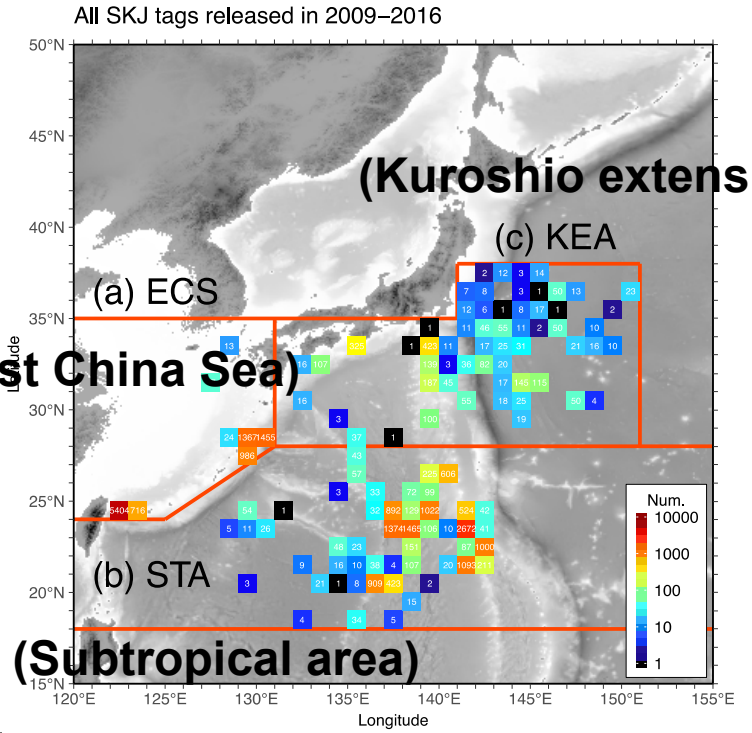
Skipjack tagging project by Japan since 2009 (NRIFSF with several organizations)

- We focus on investigating migration (route and mechanism) to Japanese waters, and tagging is mainly conducted in the subtropical area (including coastal area).
- Tagging is mainly conducted in winter to early spring (just before main fishing season around Japan), targeting small fish (mainly 35cm – 48cm).
- Both conventional and archival tagging (partly sonic tagging as well) are conducted.

Image of cooperative skipjack tuna tagging project in Japan



Summary results of SKJ tagging after 2009



[Season and area]
Jan.-Mar（Subtropical）
May-Jun（Temperate）

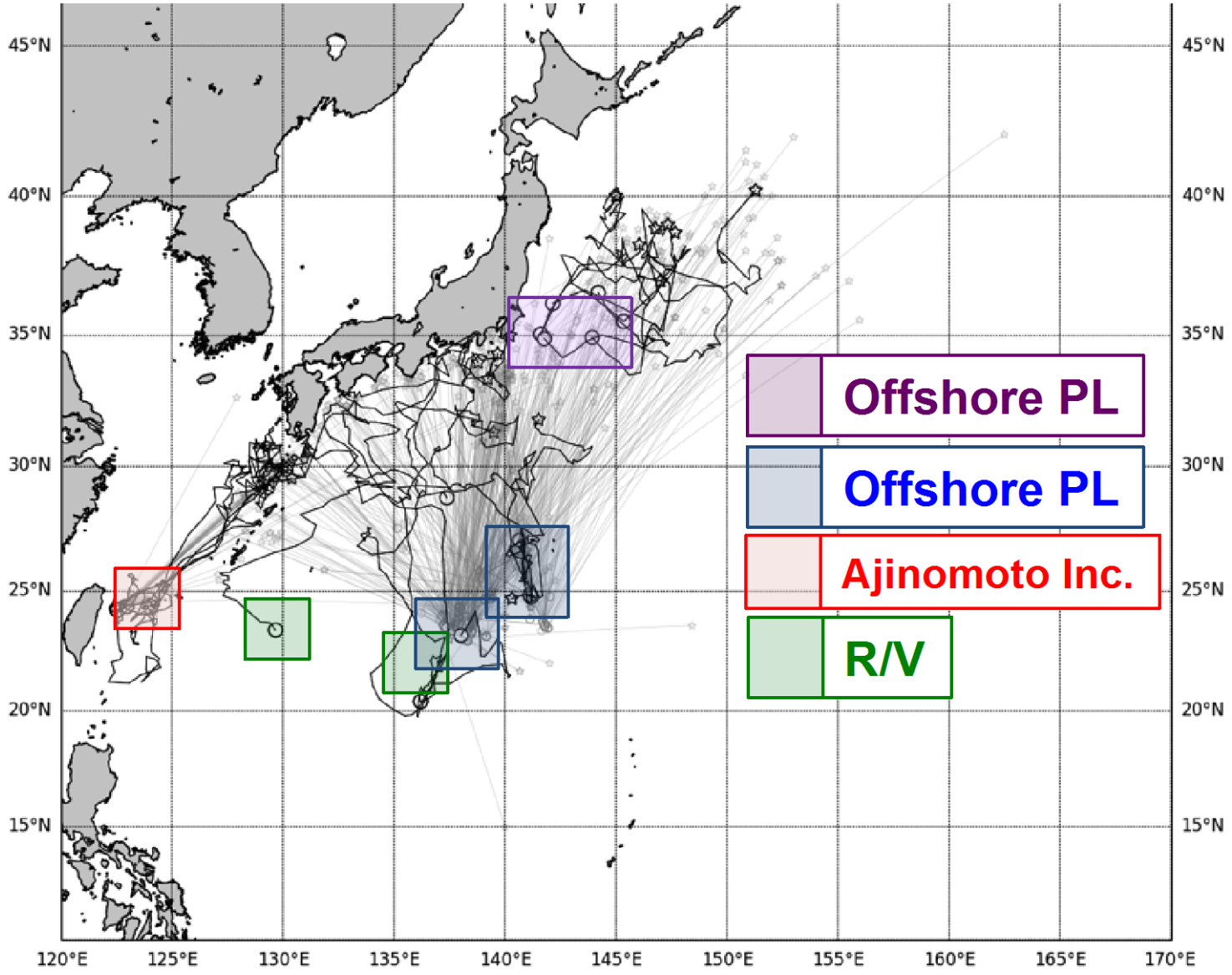
[Size at release]
35cm – 48cm

Dart: dart (conventional) tag
Arc: archival tag

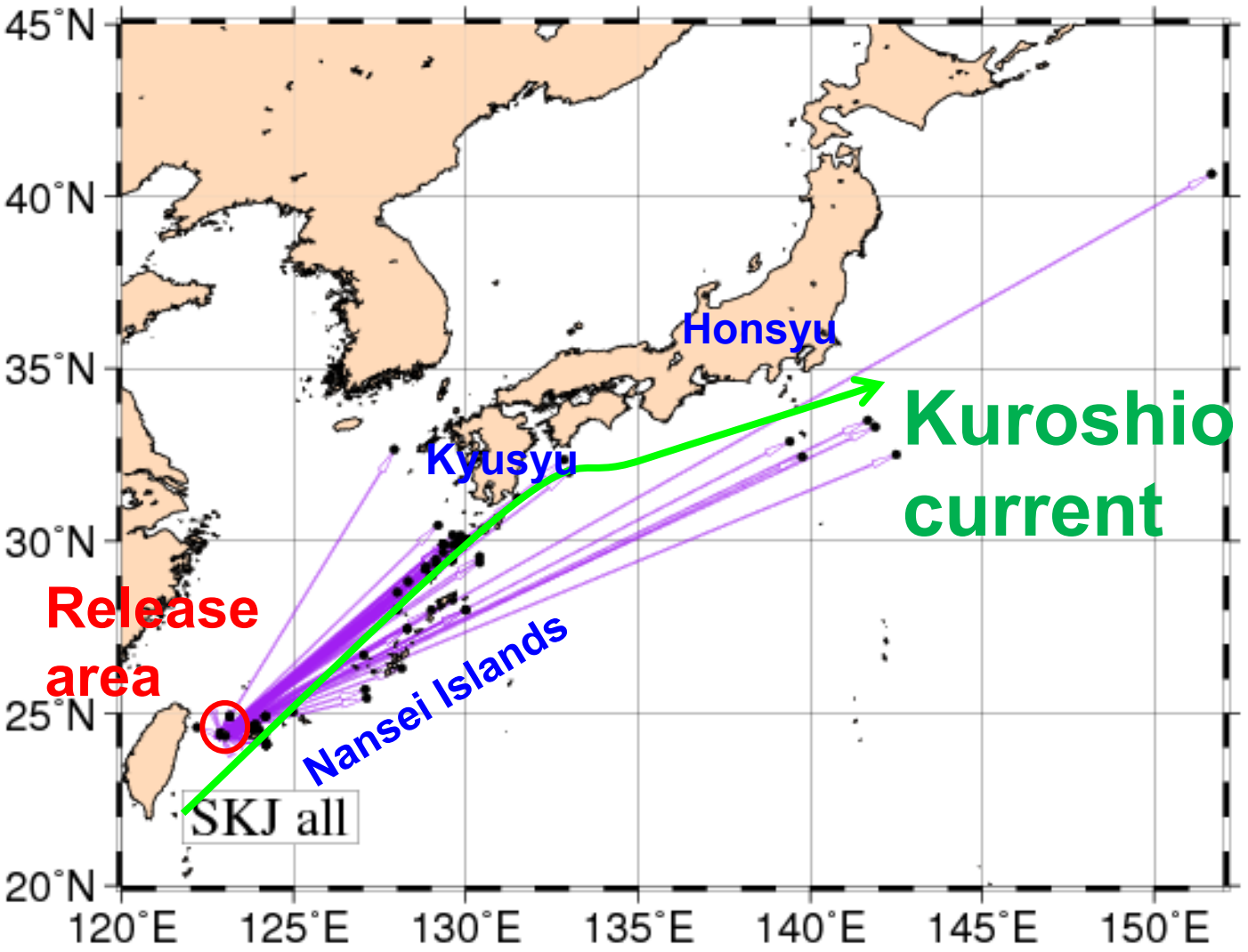
Several fish with pinger as well

	Number of release								Number of recapture	
	ECS Feb.-Jun.		STA Jan.-Jun.		KEA May-Jul.		Total			
Release Year	Dart	Archival	Dart	Archival	Dart	Archival	Dart	Archival	Dart	Archival
2009	1,293	-	367	-	314	-	1,319	-	97	-
2010	2,854	44	110	-	892	-	3,361	-	147	-
2011	77	-	229	83	157	-	677	83	35	2
2012	2,995	169	3,167	109	196	-	6,628	278	227	14
2013	715	43	3,995	180	215	80	4,950	320	452	23
2014	730	94	369	104	350	212	1,451	410	52	33
2015	292	139	1,990	149	979	127	2,647	415	468	21
2016	678	183	3,687	180	732	67	5,254	510	156	17
Total	9,634	672	13,914	805	3,835	486	27,383	1,963	1,634 (6.0%)	106 (5.4%)

Movement of SKJ



Movement of the fish released in Japanese coastal area

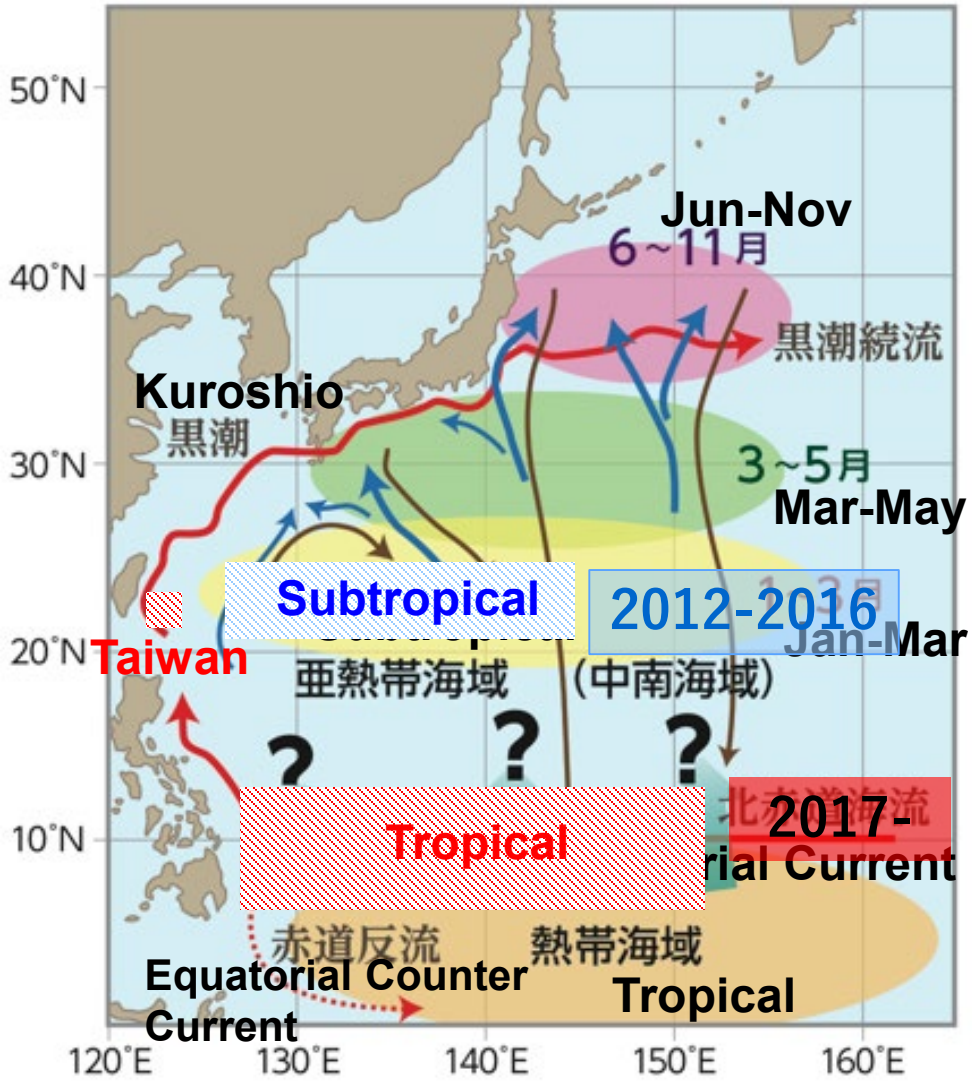


Estimated migration route based on tagging

- **Northward** movement from winter to autumn.
- **Southward** movement around late autumn.
- Several migration routes seem to exist.
- Detail of connection between tropical and subtropical areas is unclear.

SKJ tagging in very recent years

- Tagging is being conducted also in the lower latitude (including tropical area): to approach “potential” origin of migration.
- Tagging in southeast Taiwan area (further upstream of Kuroshio current) started in 2018 (in cooperation with Ajinomoto Co Inc. and Taiwan FRI).
- We would like to clarify more in detail about skipjack migration in conjunction with other investigations (e.g. larval survey).



Overview of BET and YFT tagging

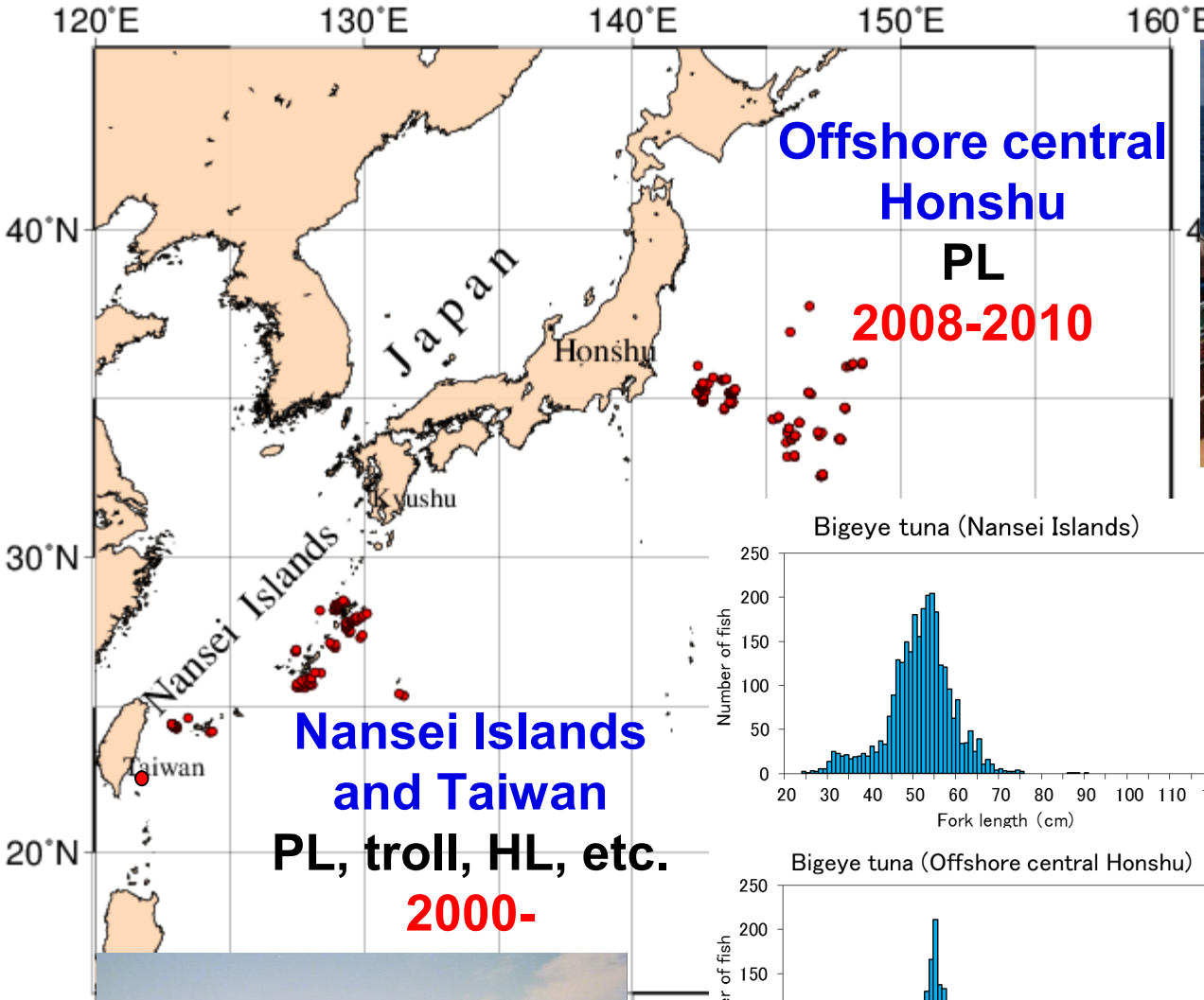
Backgrounds

- Northwestern Pacific Ocean including Japanese water is one of fishing grounds for tropical tunas (LL, PS, PL, etc).
- No large scale tagging targeting BET and YFT had been conducted in this area or by Japan until 1990s.
- Fisheries Agency of Japan (Japanese government) in cooperation with NRIFSF conducted BET and YFT around Japan during 2000-2010.

Summary of BET and YFT tagging

Project	National tropical tuna tagging project	National tagging project for bigeye tuna	Skipjack tagging project with Ajinomoto Co. Inc. and Taiwan
Primary target species	BET and YFT	BET	SKJ
Location	Nansei Islands (southwestern Japan) 24–29° N, 123–130° E	Offshore central Honshu 32–36° N, 142–148° E	Nansei Islands (southwestern Japan) and southeast Taiwan 22–23° N, 121–123° E
Period	Mar. 2000– Oct. 2010	Jun. 2006– Jul. 2010	Jun. 2011–
Season of release	All year (mainly spring to autumn)	Summer	Mainly winter to spring
Fishing method	PL, troll, HL, etc.	PL	Mainly troll

Location of release, period of study and fish size



Offshore central Honshu

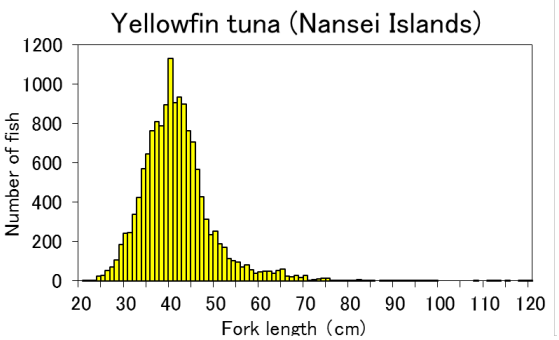
PL

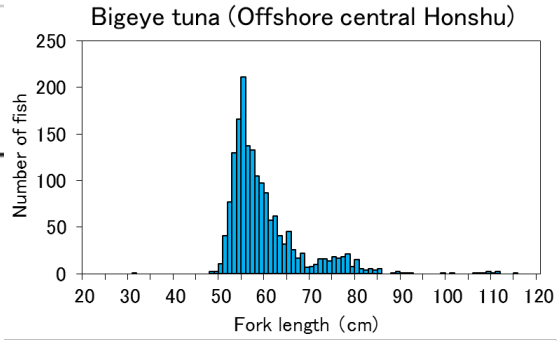
2008-2010

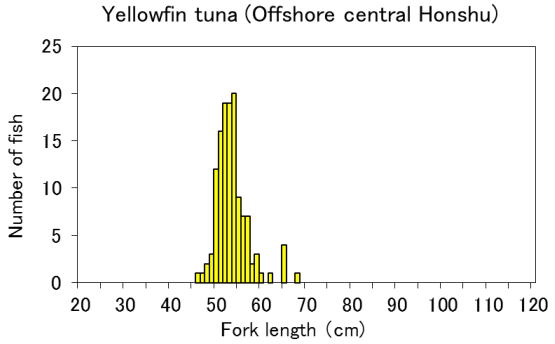
Nansei Islands and Taiwan

PL, troll, HL, etc.

2000-



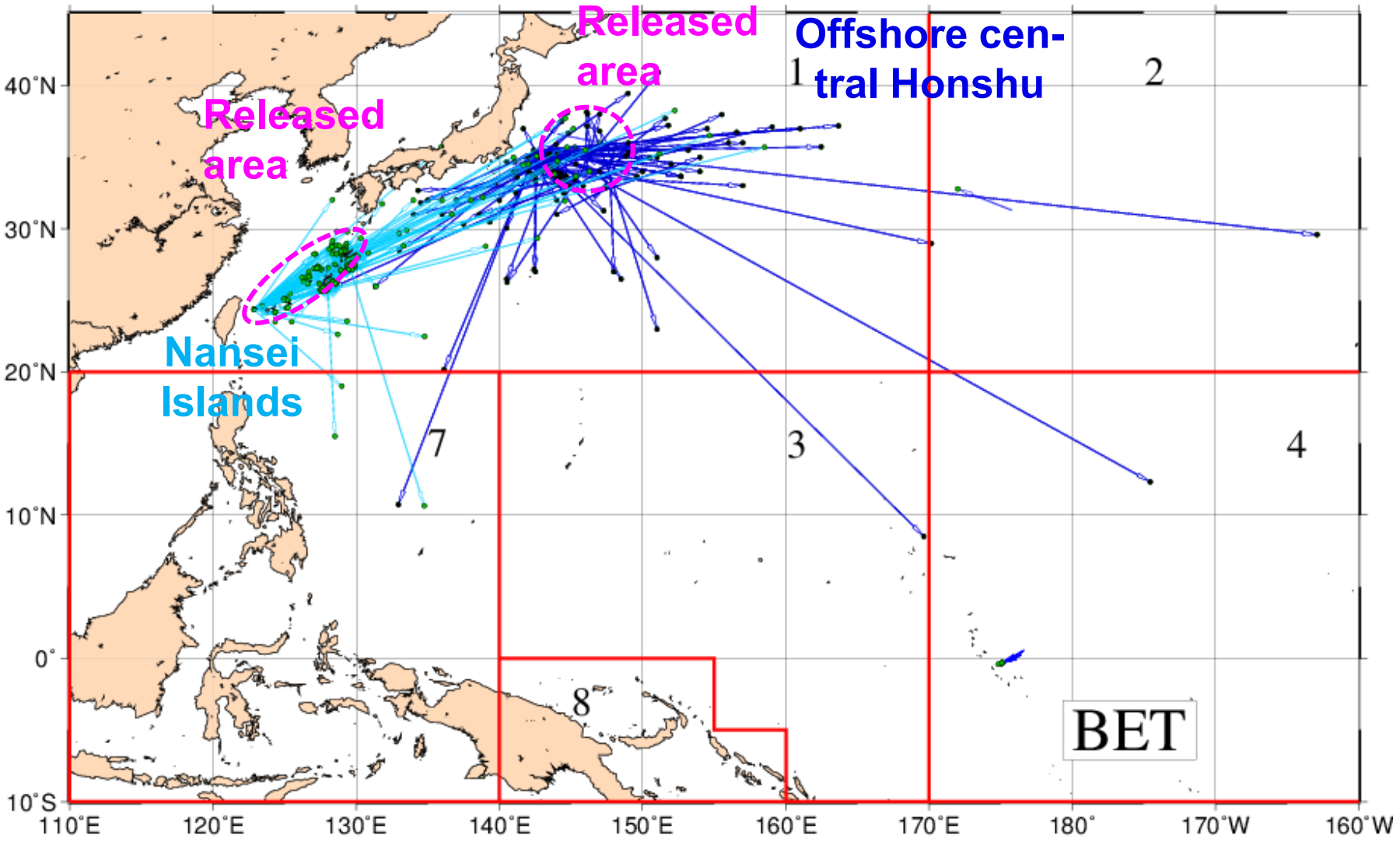




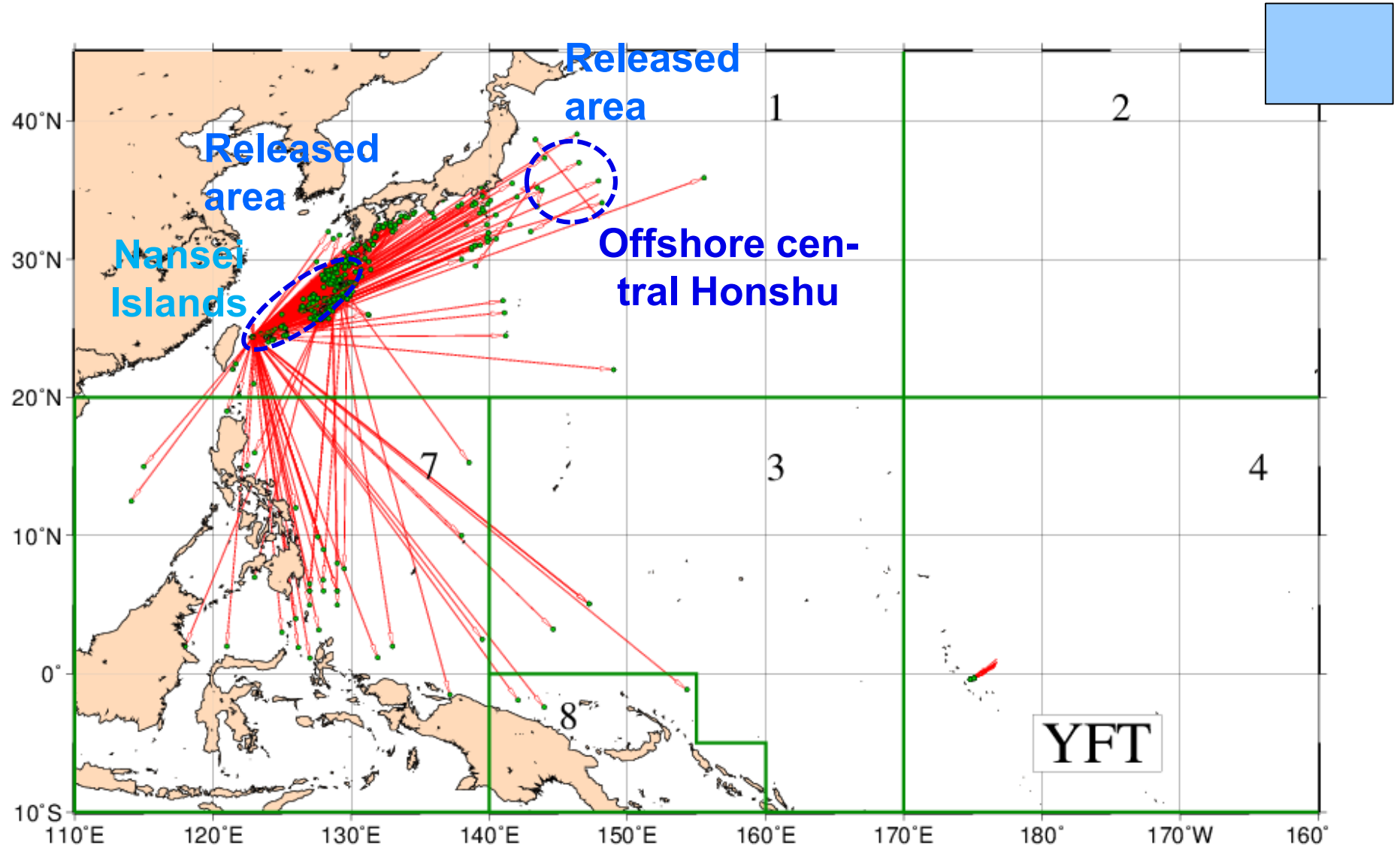
Number of release and recapture (as of April 2017)

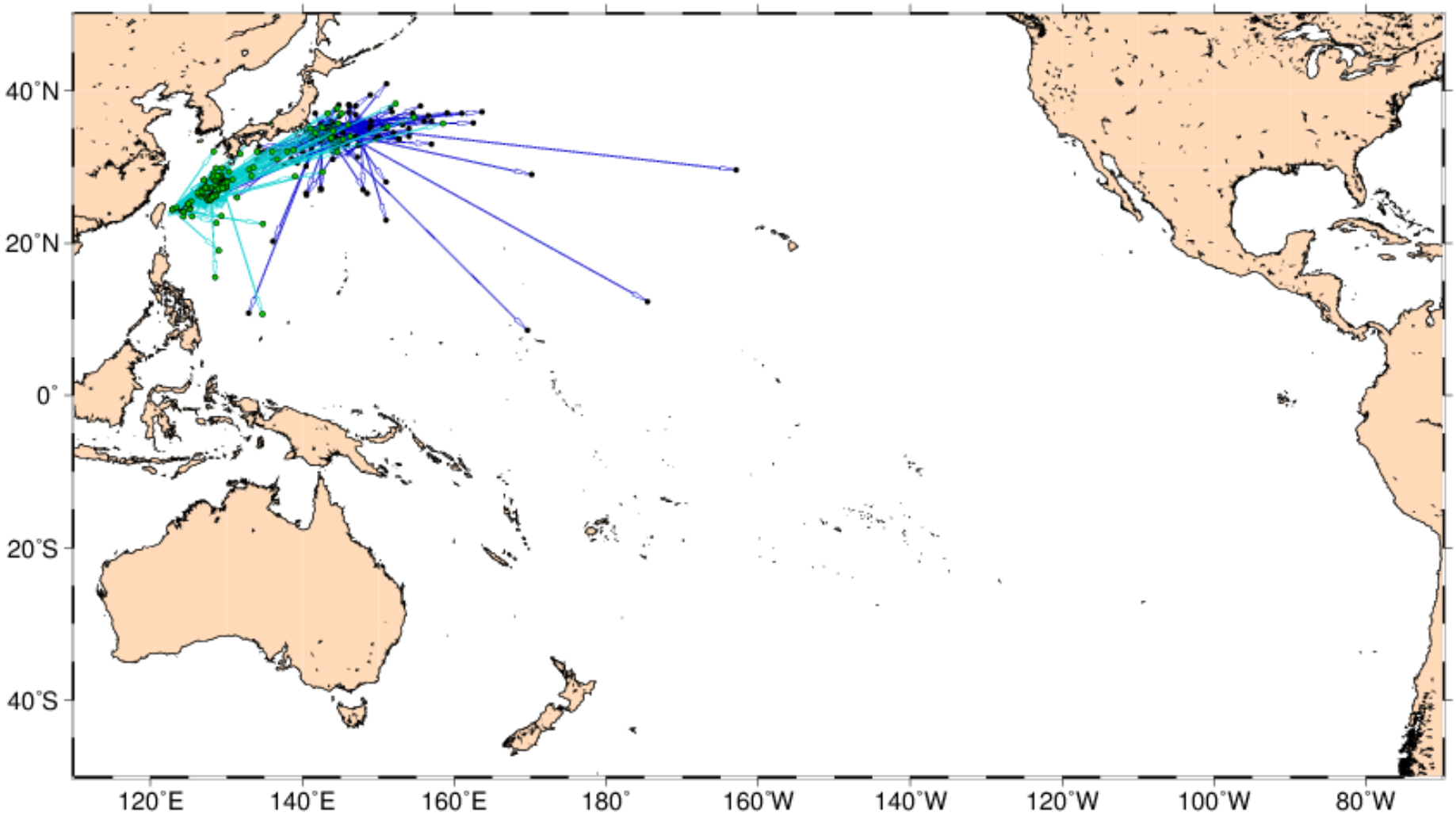
	Bigeye tuna			Yellowfin tuna		
Release project	Release	Recapture	Recapture rate	Release	Recapture	Recapture rate
National tropical tuna tagging project	2,691	306	11.4%	12,899	986	7.6%
National tagging project for bigeye tuna	1,763	164	9.3%	136	5	3.7%
Skipjack tagging project with Ajinomoto Co. Inc.	194	20	10.3%	1,831	151	8.2%
Total	**4,648**	**490**	**10.5%**	**14,866**	**1,142**	**7.7%**

Movement of the fish (bigeye tuna)

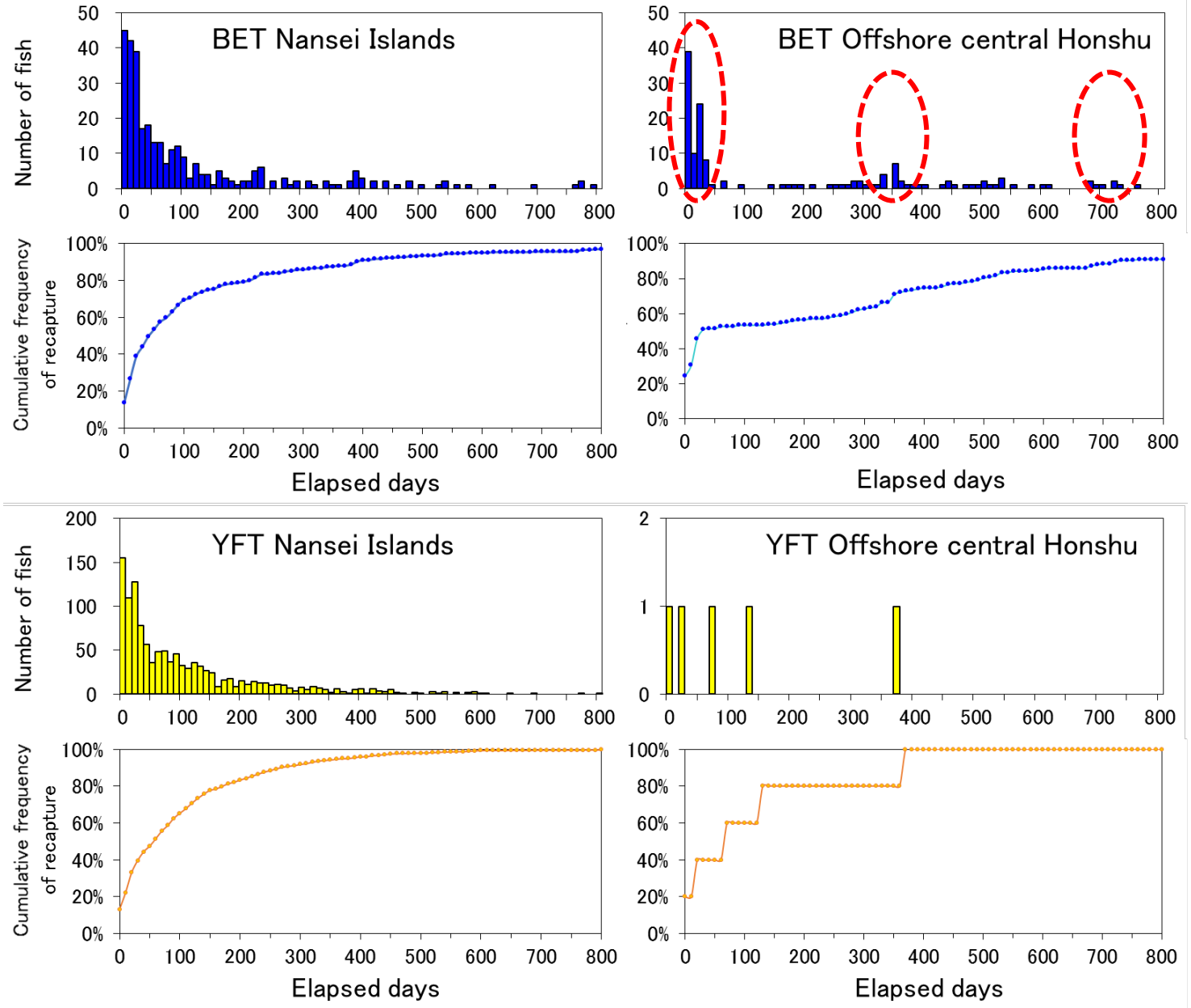


Movement of the fish (yellowfin tuna)

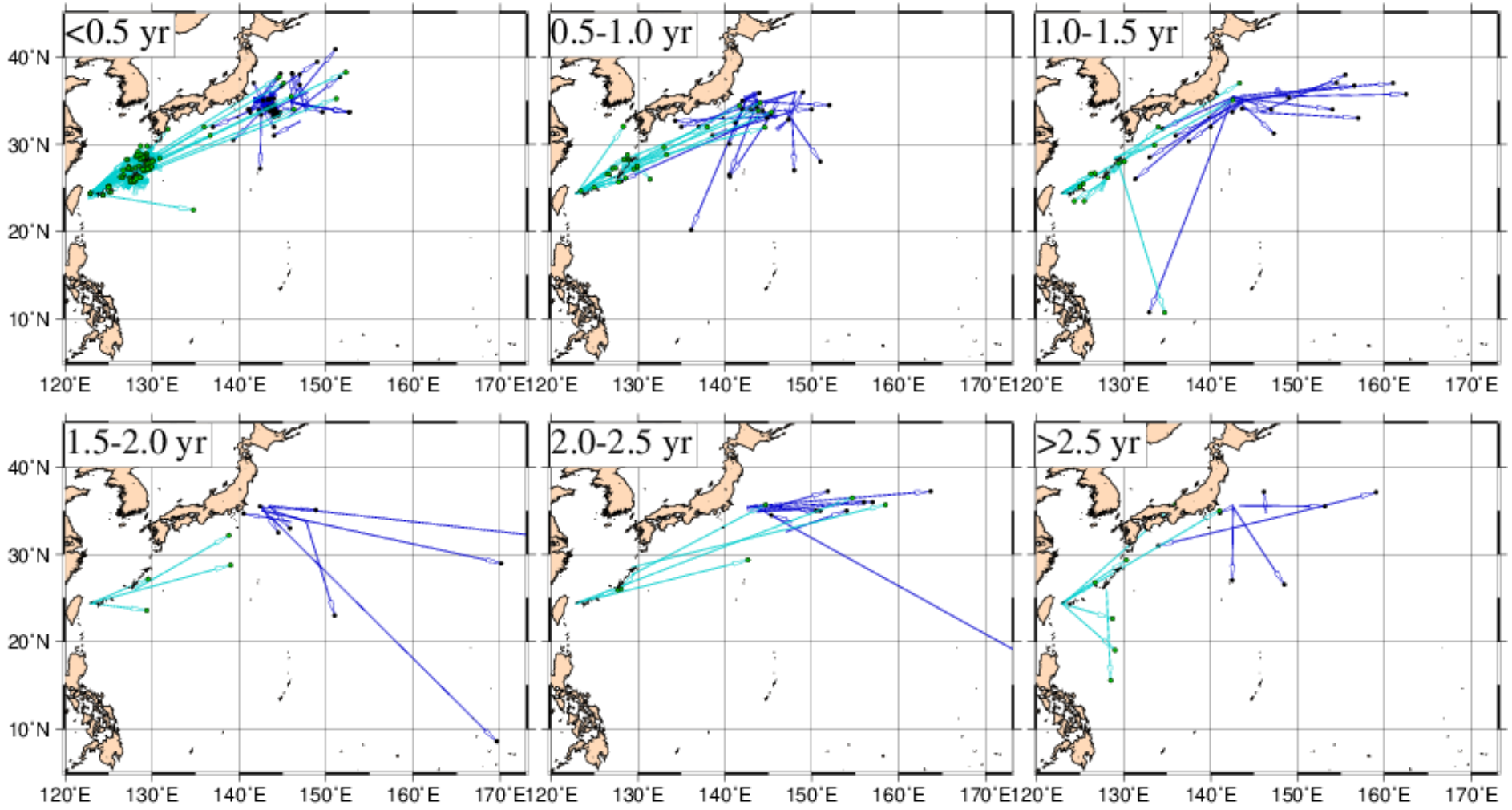



40°N
20°N
0°
20°S
40°S
120°E
140°E
160°E
180°
160°W
140°W
120°W
100°W
80°W

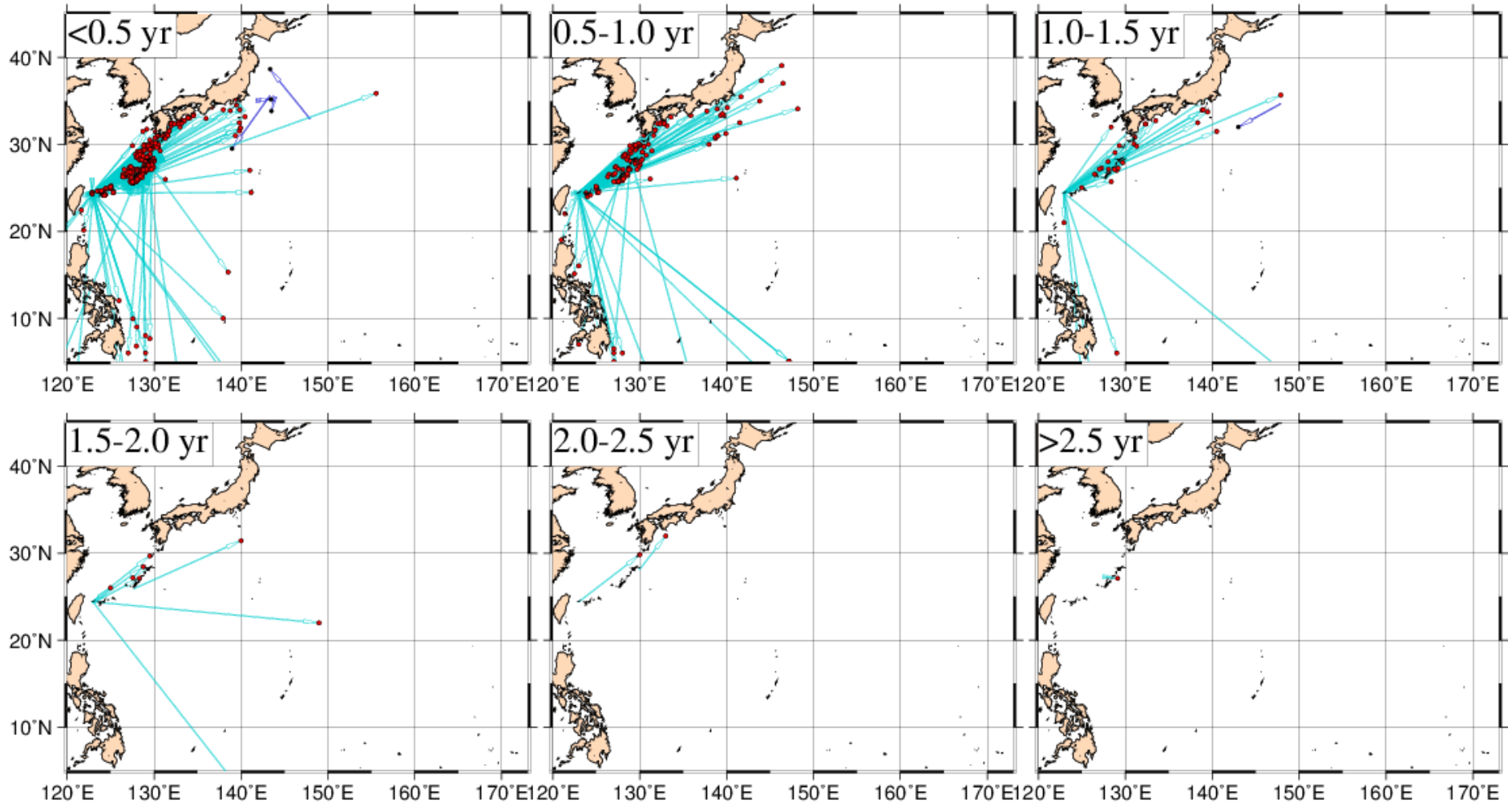
Time at liberty



Movement of the fish by time at liberty (BET)



Movement of the fish by time at liberty (YFT)

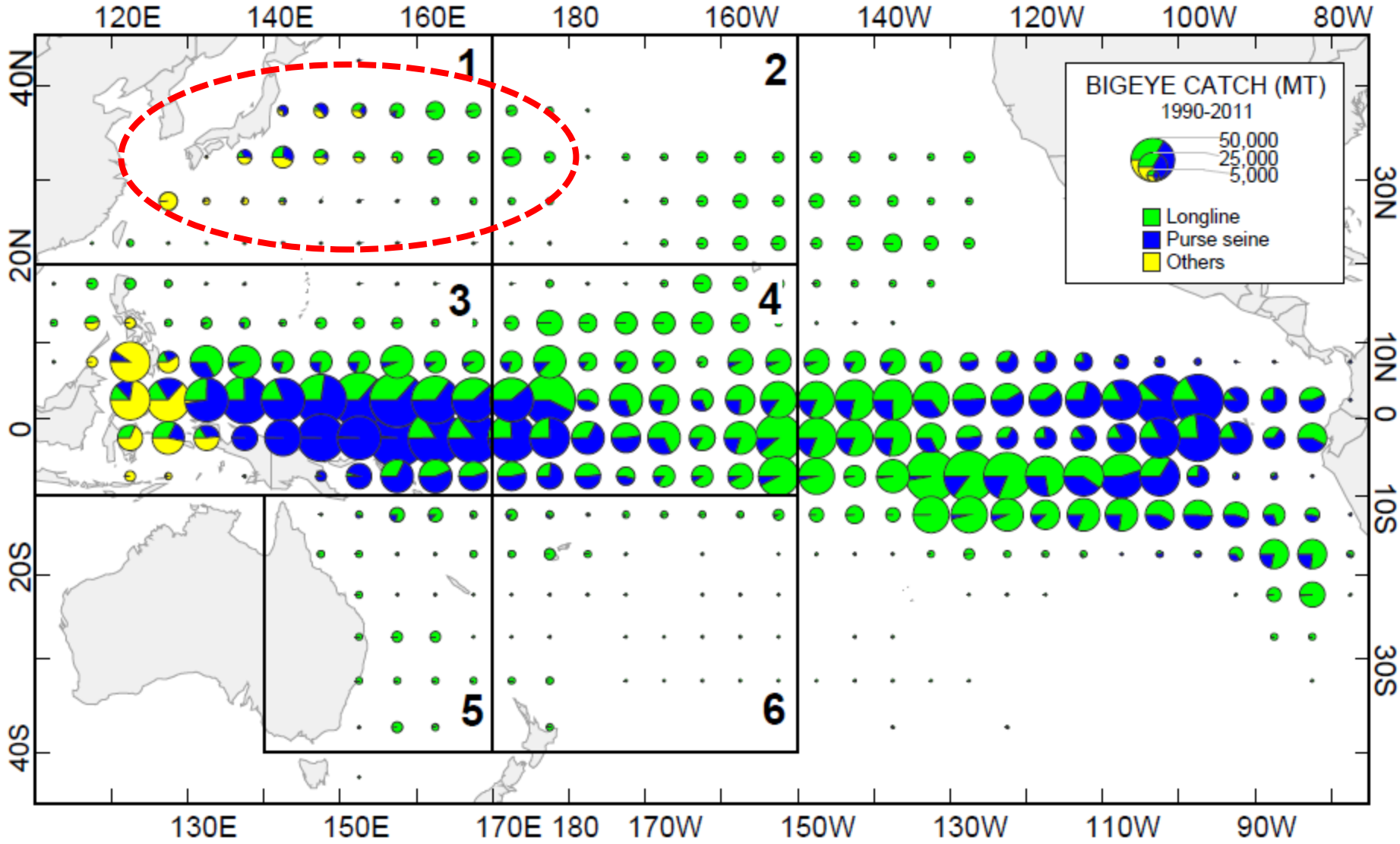


Future outlook for tropical tuna tagging by NRIFSF

- We will continue SKJ tagging.
- No plan for large scale tagging of BET and YFT (several fish are released at SKJ tagging project).
- More detailed analysis of the data.
- Publishing the results.

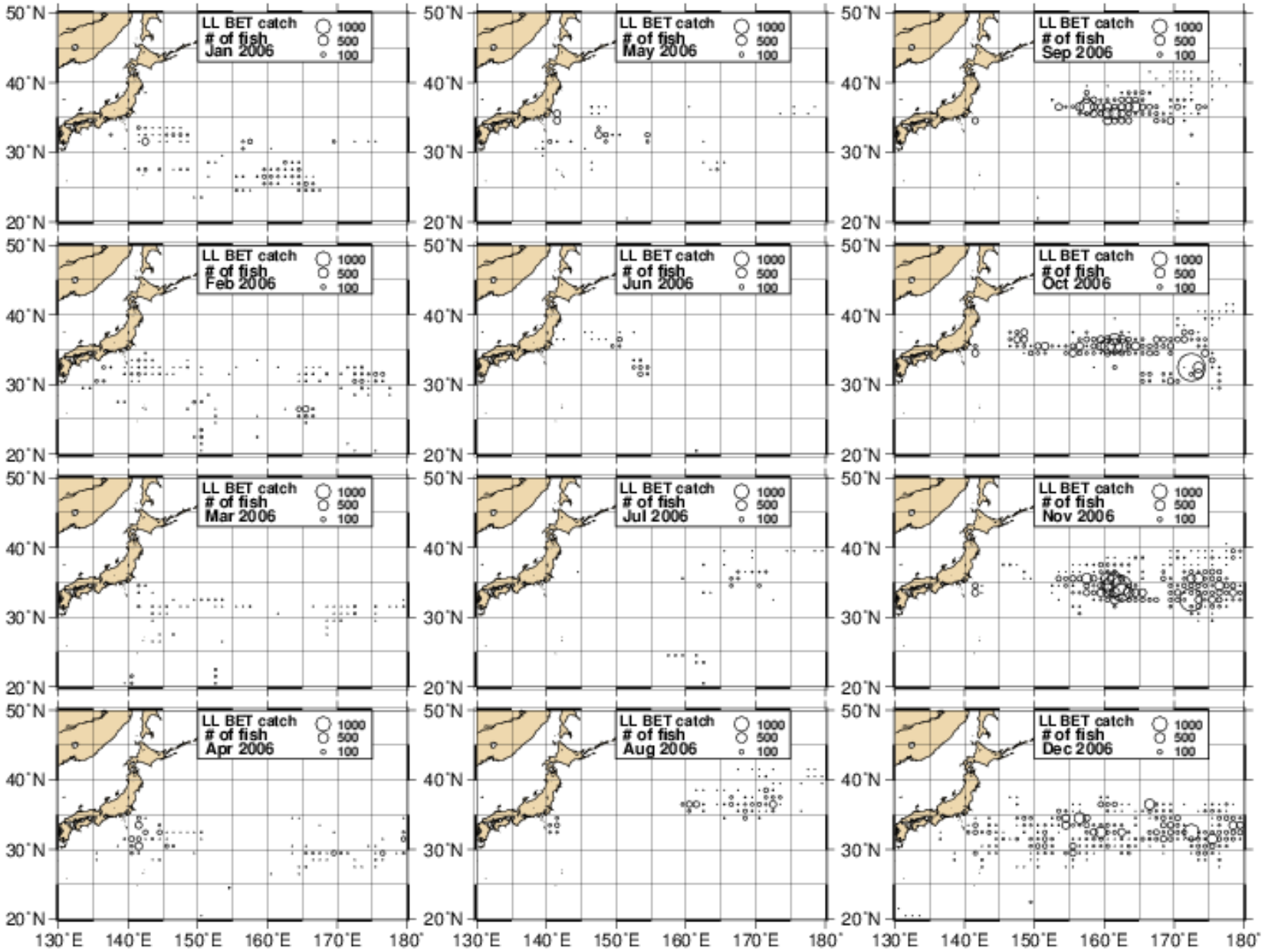
Additional slides

Distribution of bigeye catch

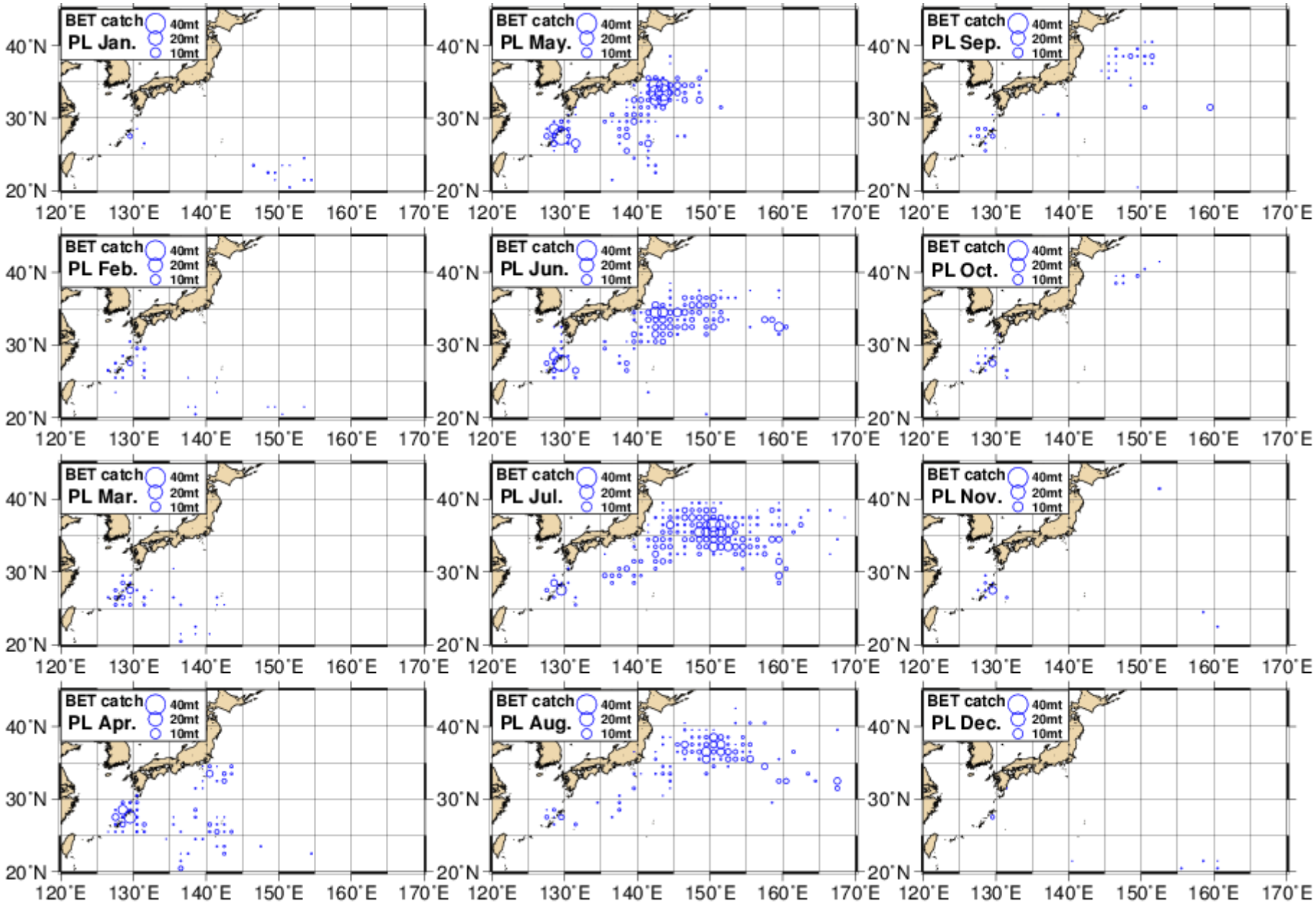


Williams and Terawasi, 2012 (WCPFC SC8)

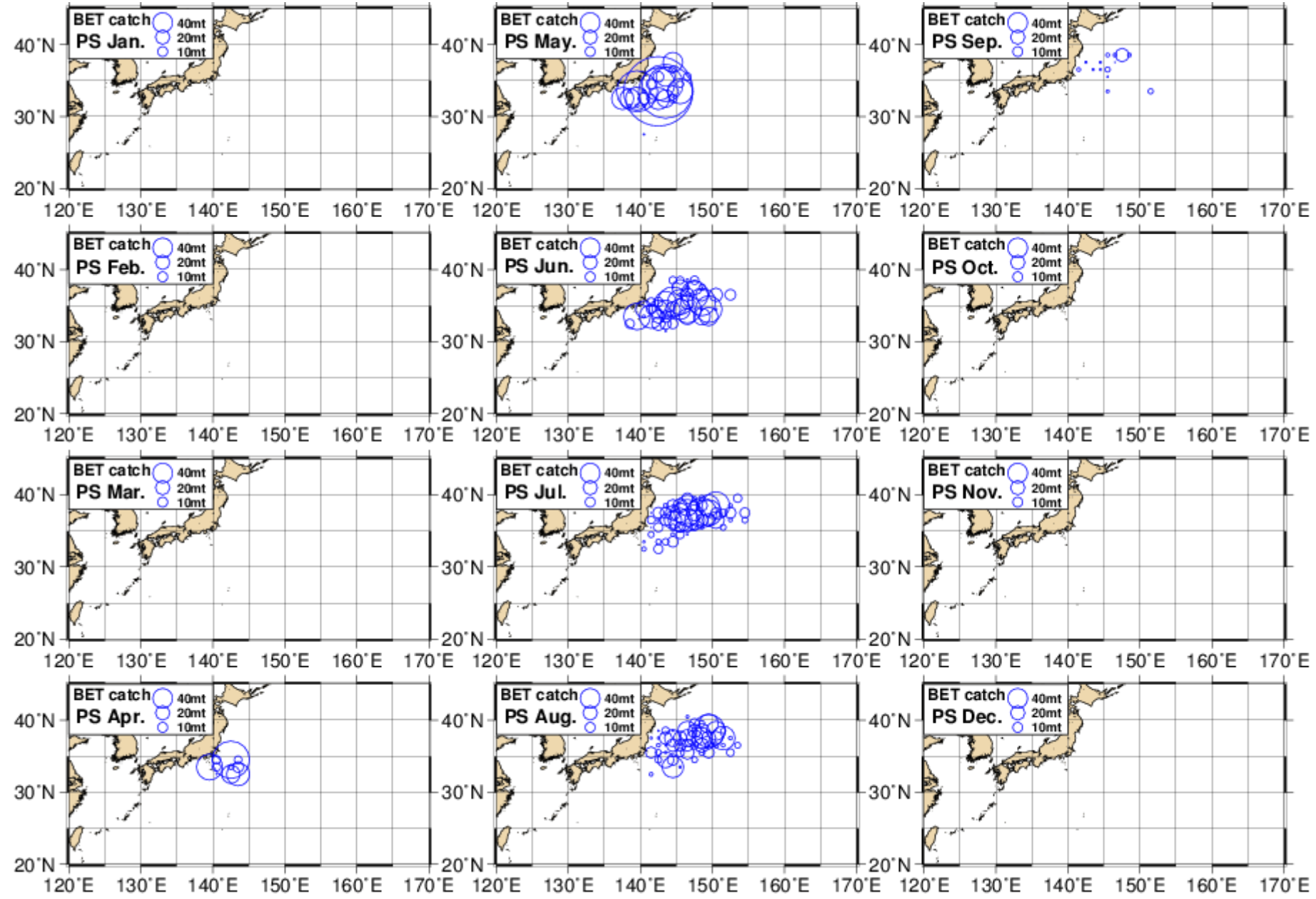
BET catch by JPN LL (2006)



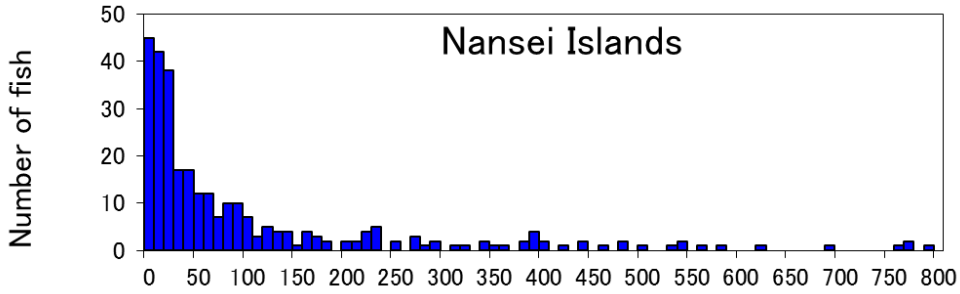
BET catch by JPN PL (2006-09 avg.)

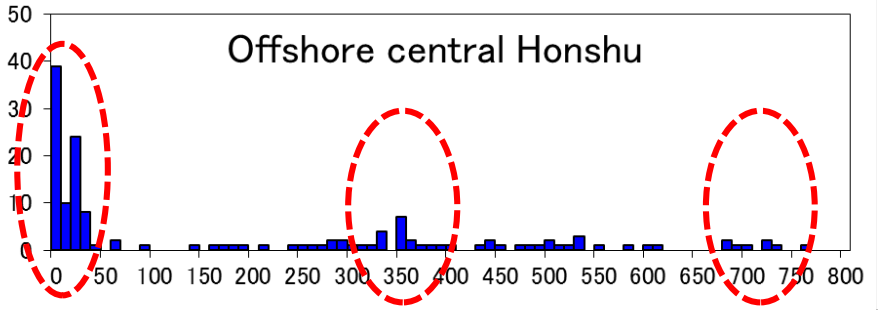


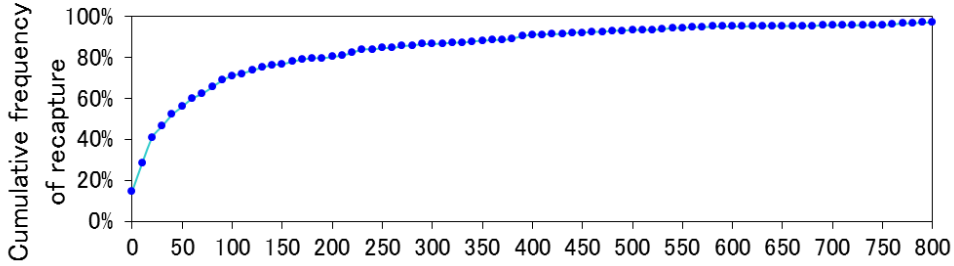
BET catch by JPN PS (2006-09 avg.)

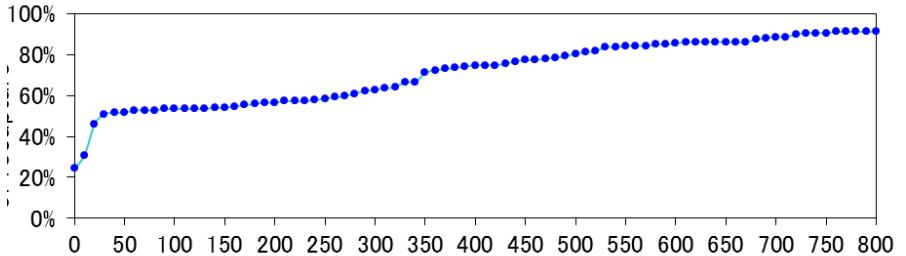


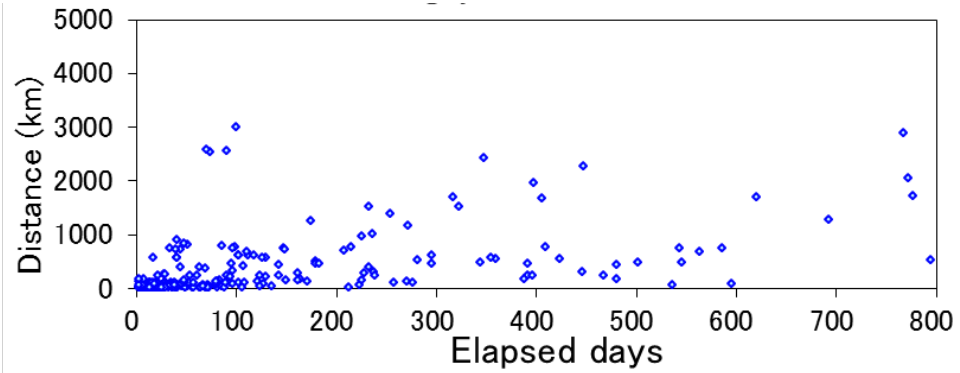
Time at liberty and distance moved

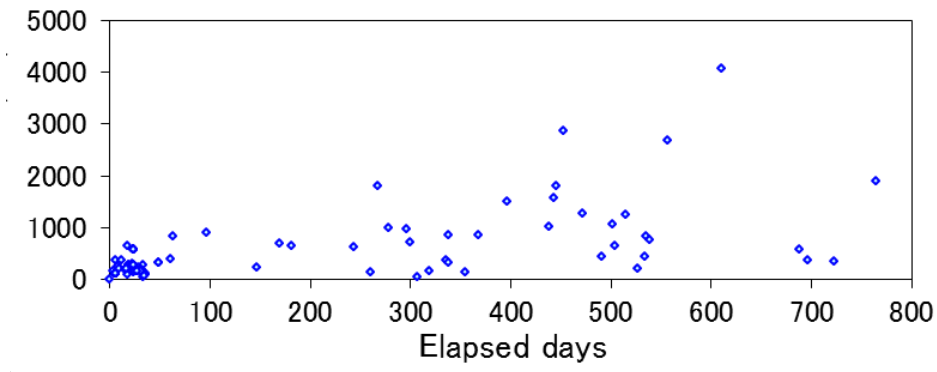


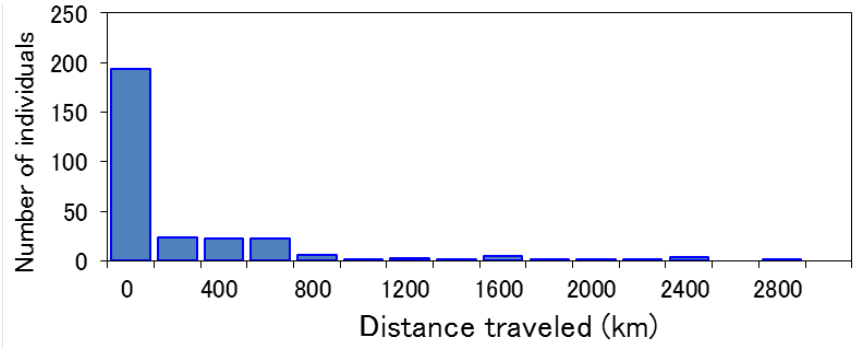


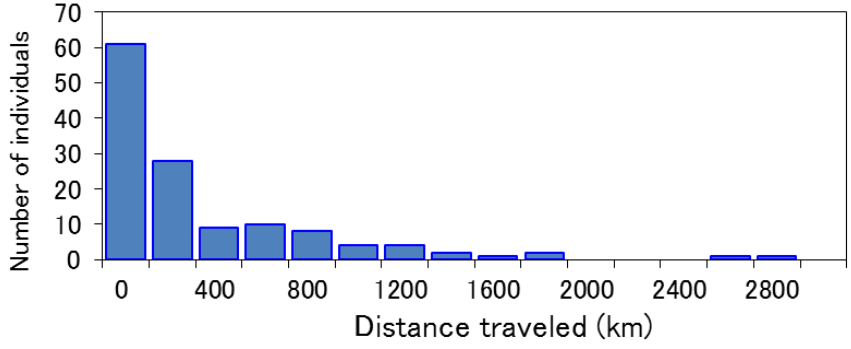




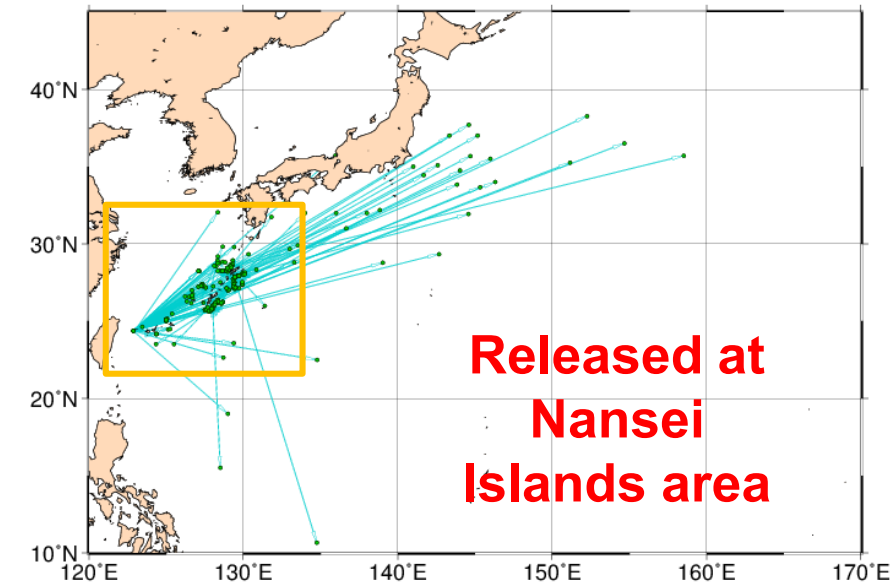




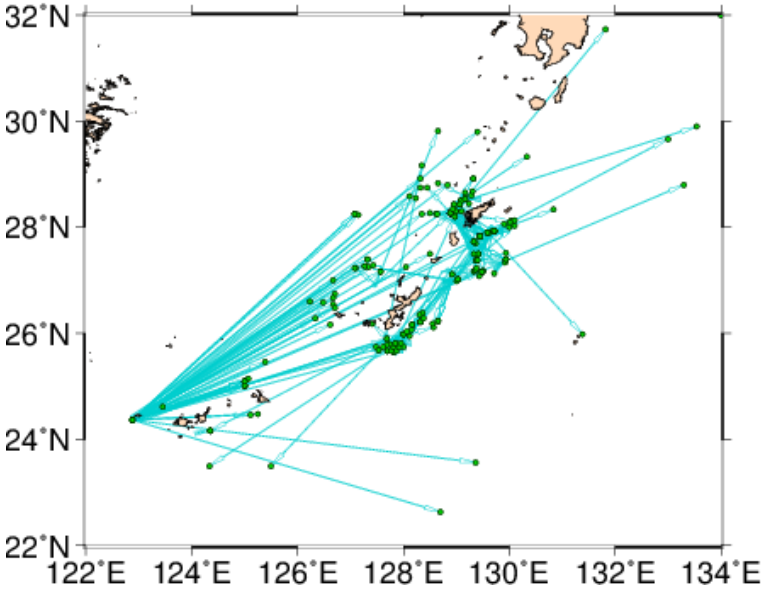


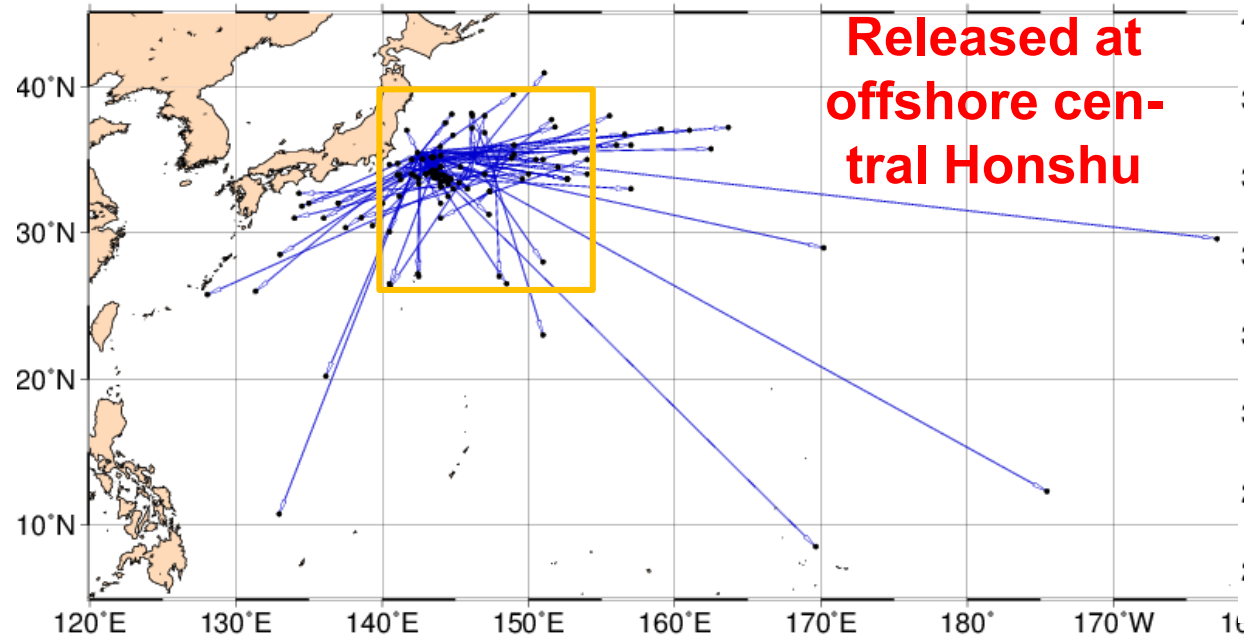


Movement of the fish (conventional tag)

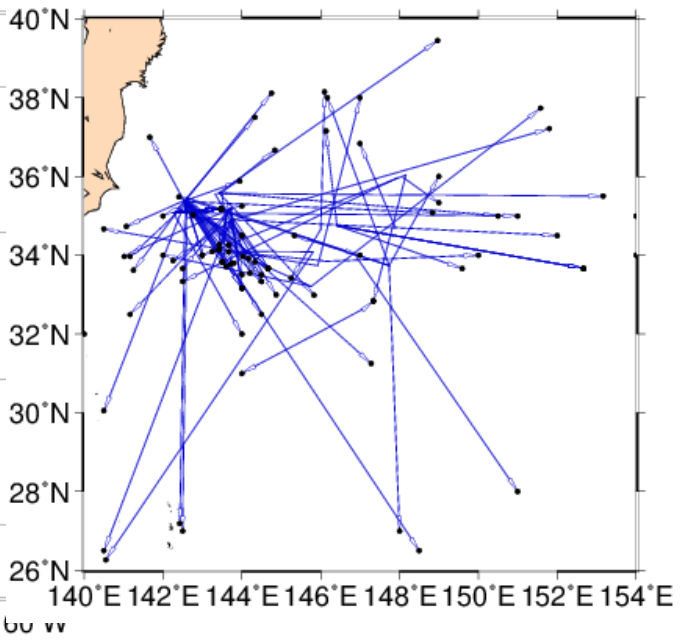


Released at Nansei Islands area





Released at offshore cen-tral Honshu



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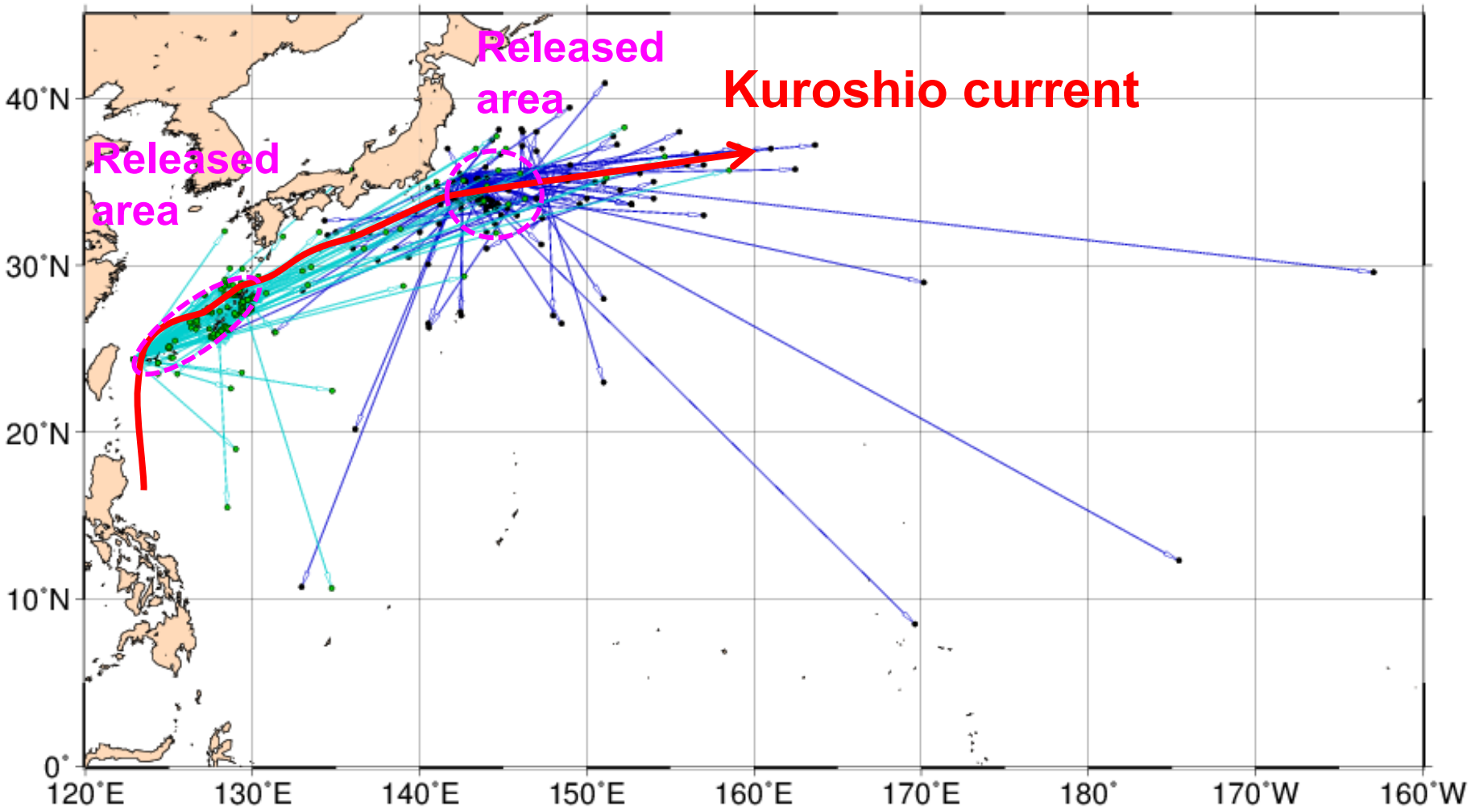
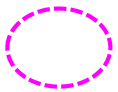
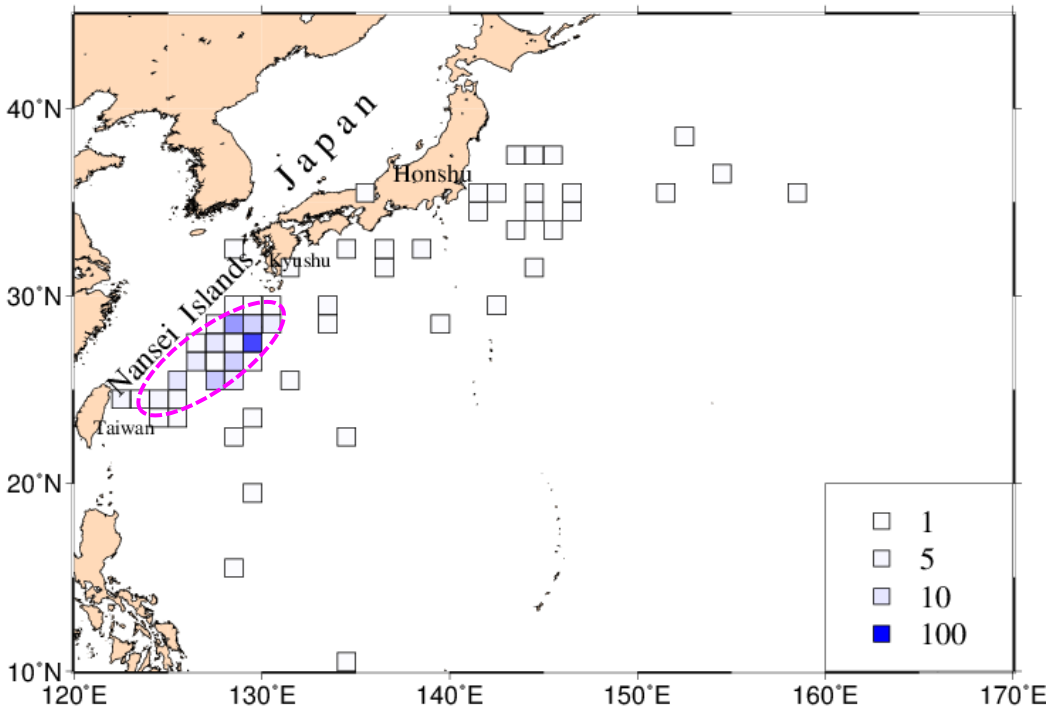
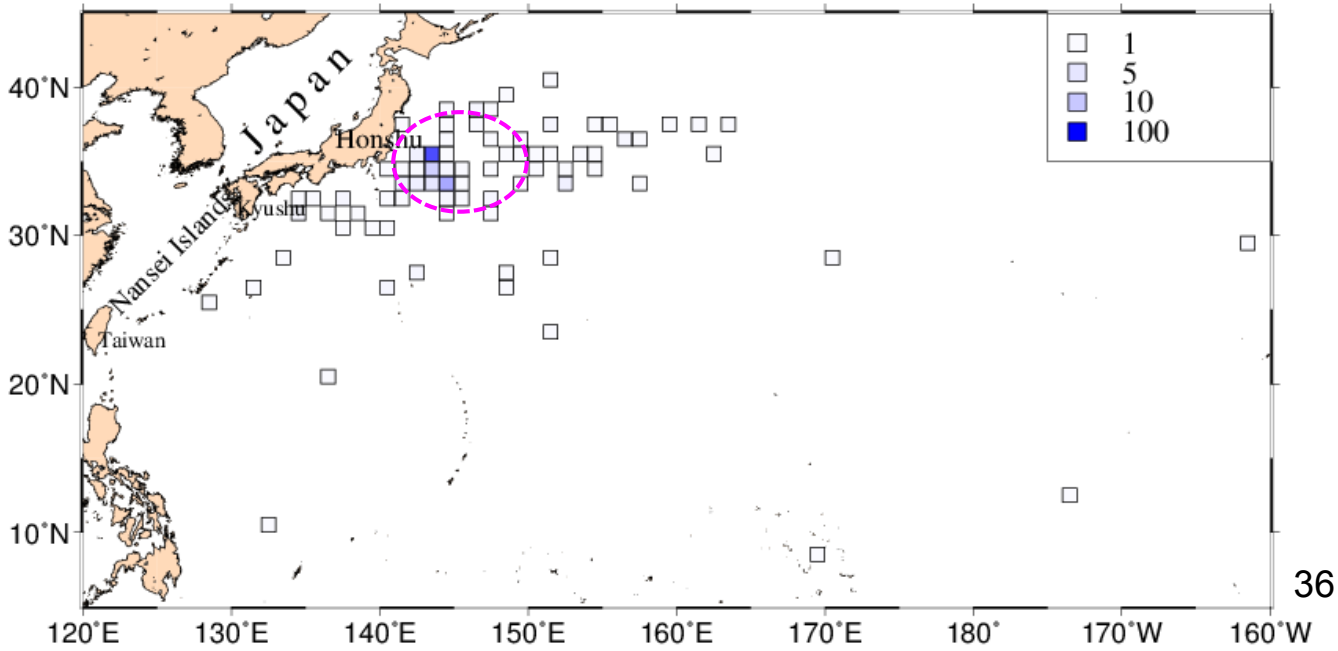


Distribution of tag recapture

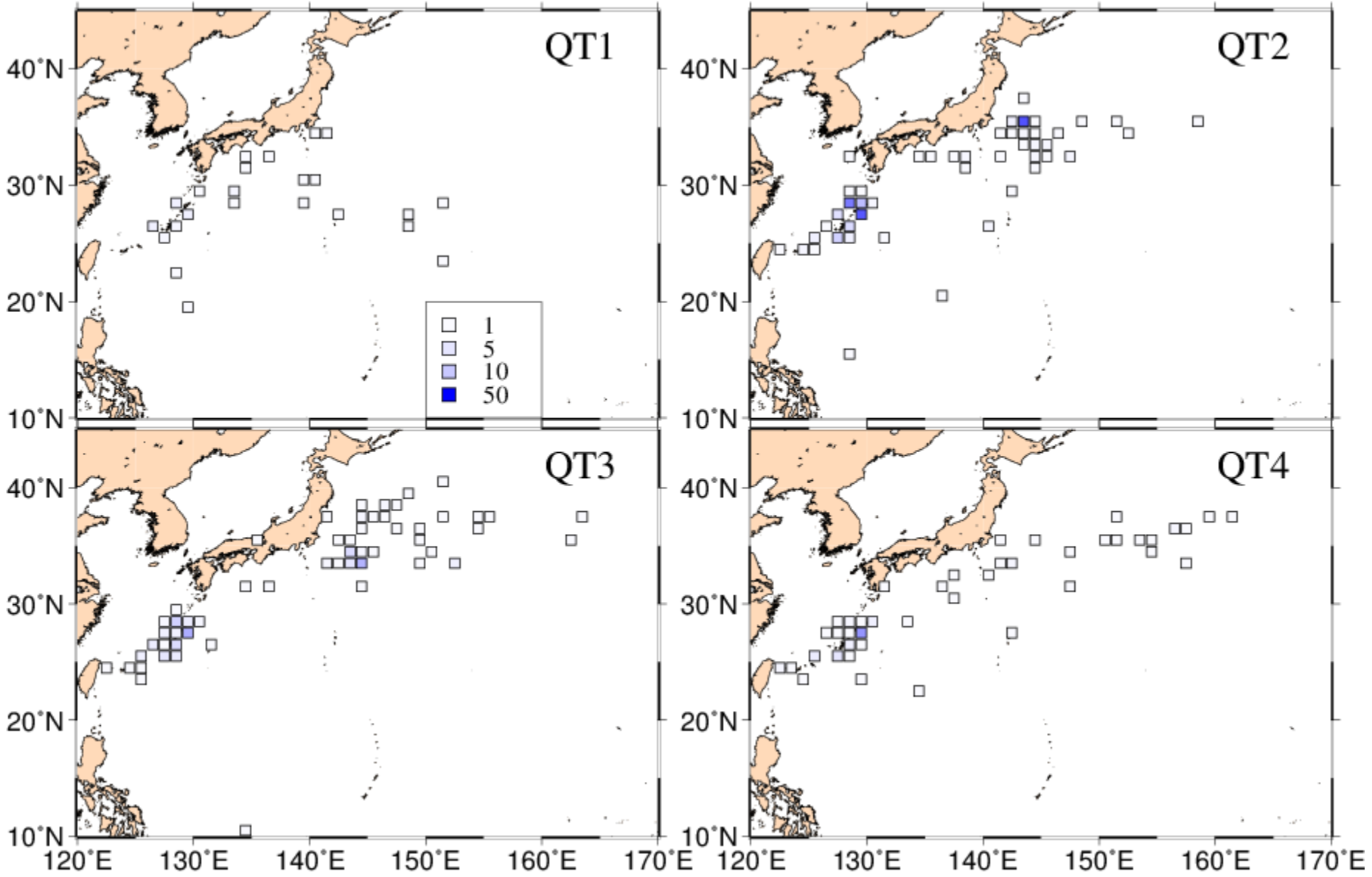


Released area



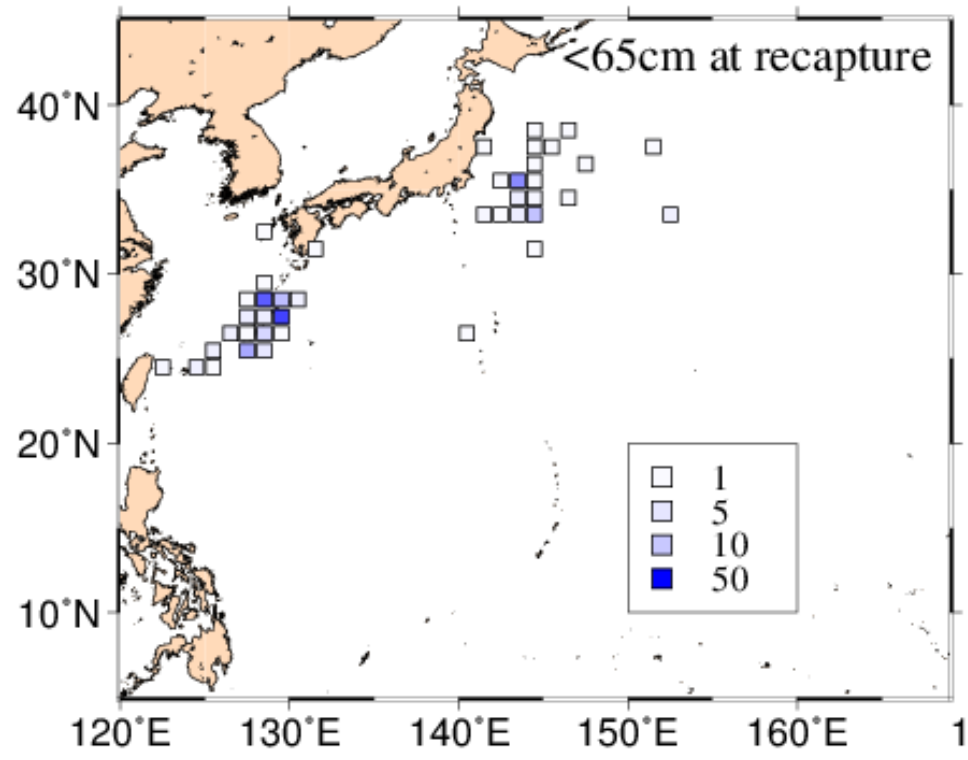


Seasonality of distribution of the recapture (both release area combined)

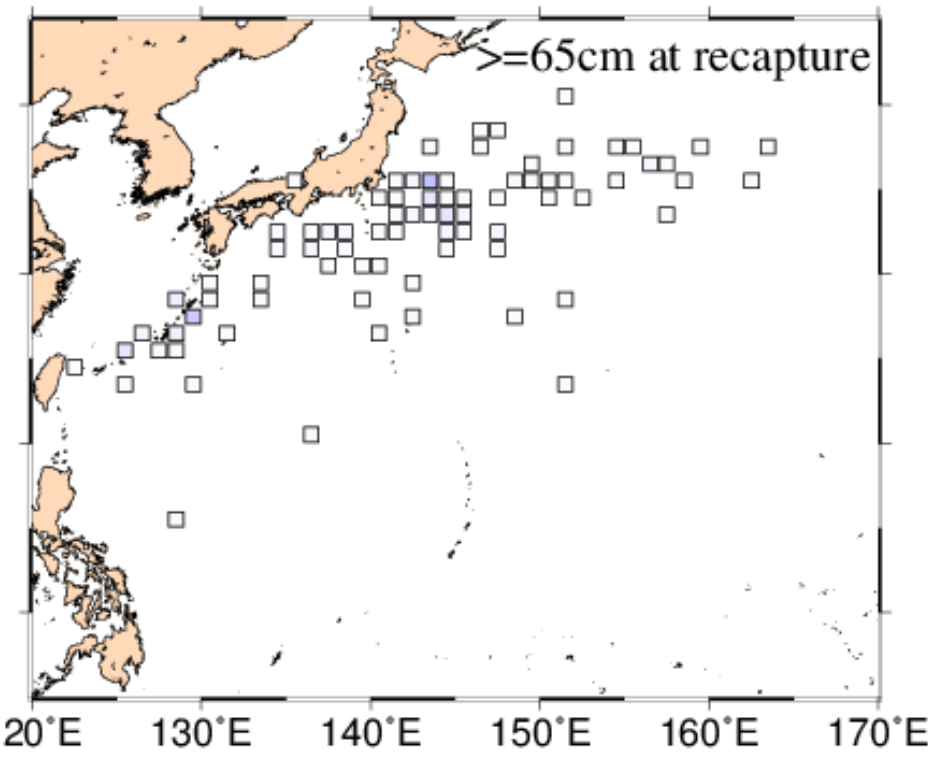


Distribution of recapture by fish size

<65cm FL at recapture



>=65cm FL at recapture



Estimated migration route in the NWPO

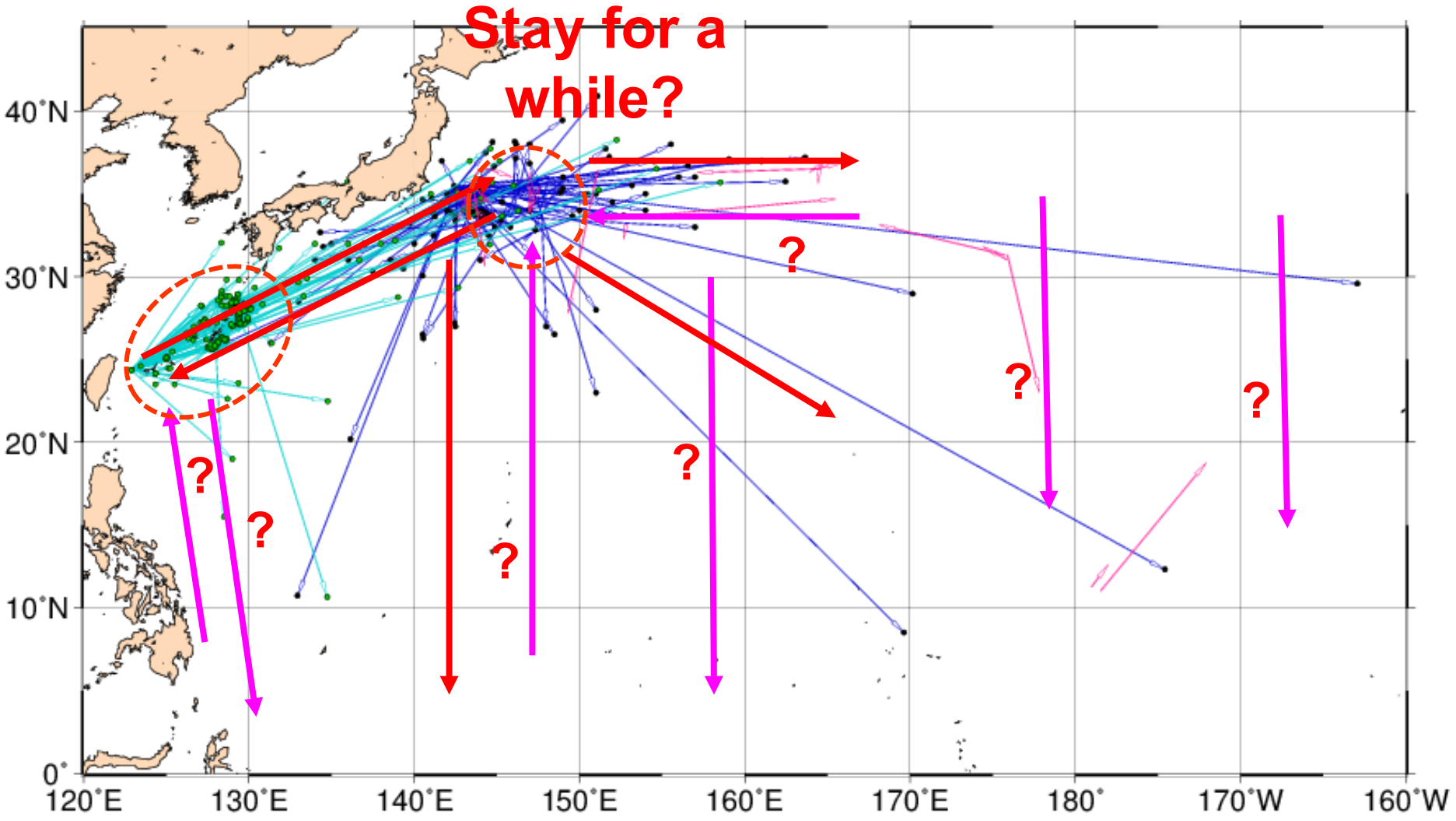
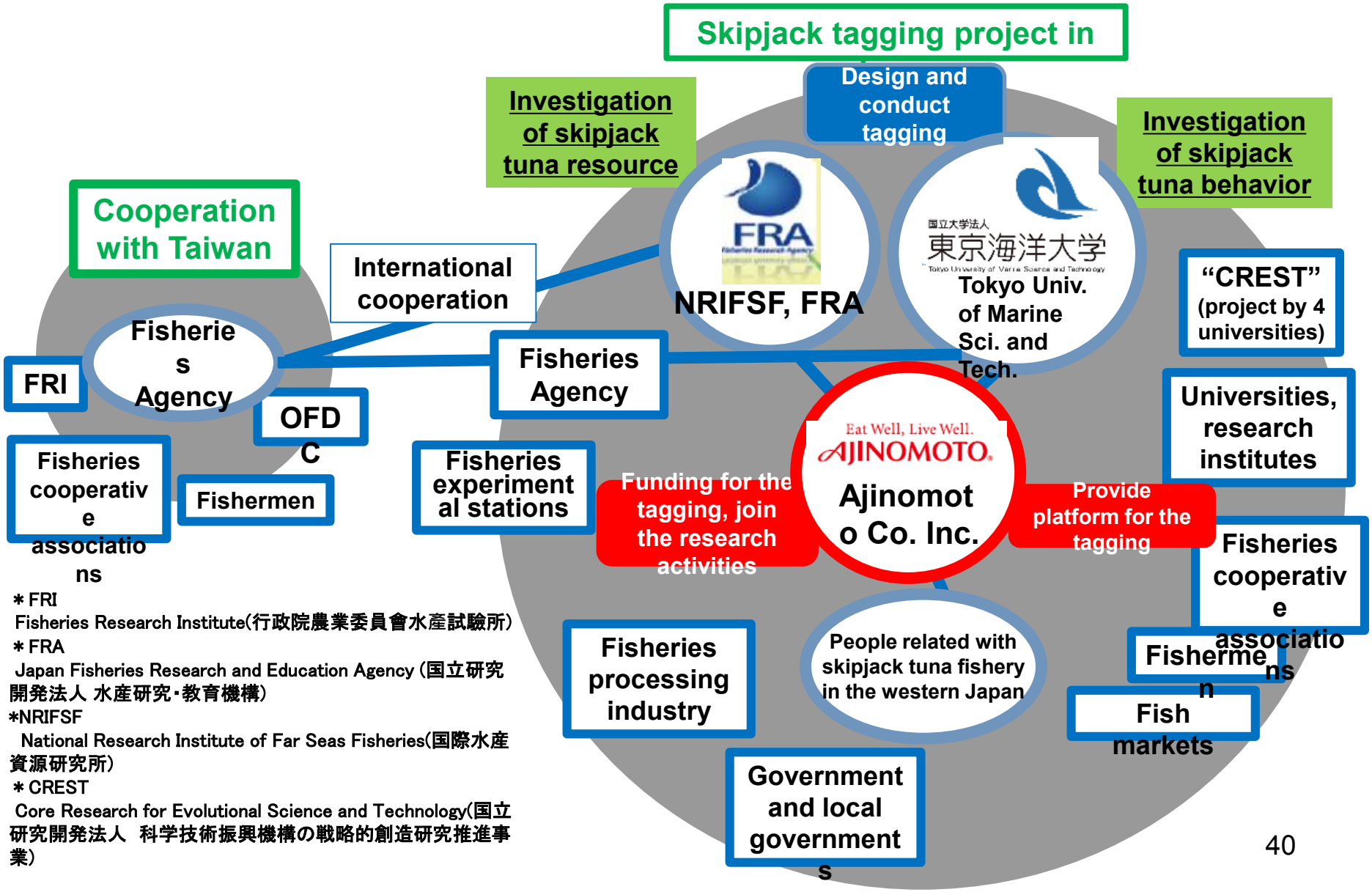
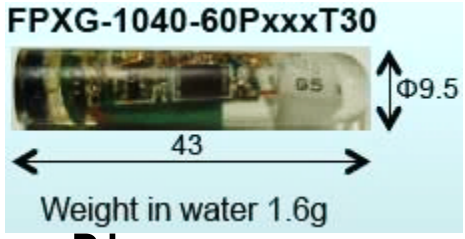


Image of cooperative skipjack tuna tagging project in the coastal area (along Kuroshio current)

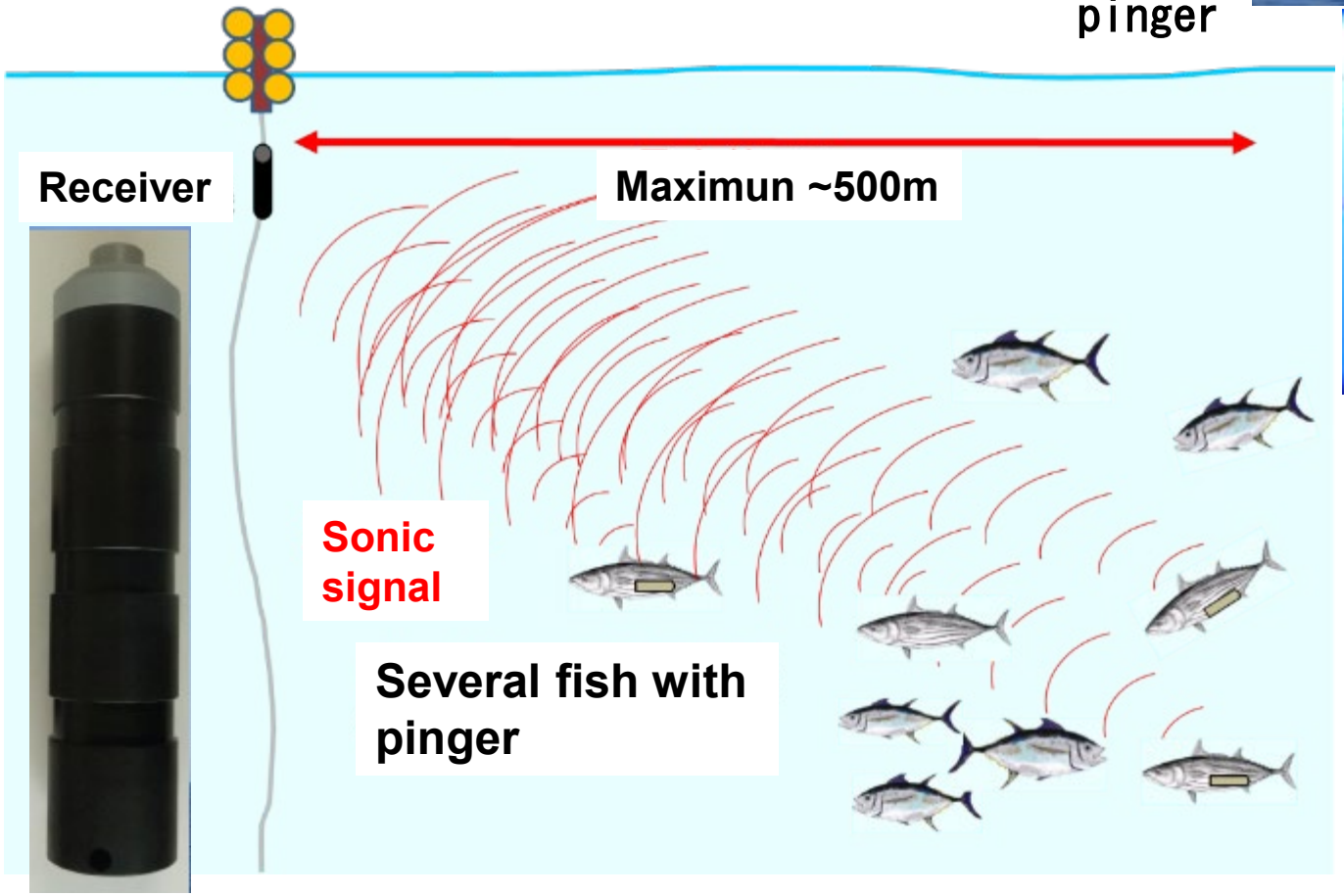


＊FRI
Fisheries Research Institute(行政院農業委員會水產試驗所)
＊FRA
Japan Fisheries Research and Education Agency (国立研究開発法人 水産研究・教育機構)
*NRIFSF
National Research Institute of Far Seas Fisheries(国際水産資源研究所)
＊CREST
Core Research for Evolutional Science and Technology(国立研究開発法人 科学技術振興機構の戦略的創造研究推進事業)

Monitoring behavior by pinger around anchored FAD

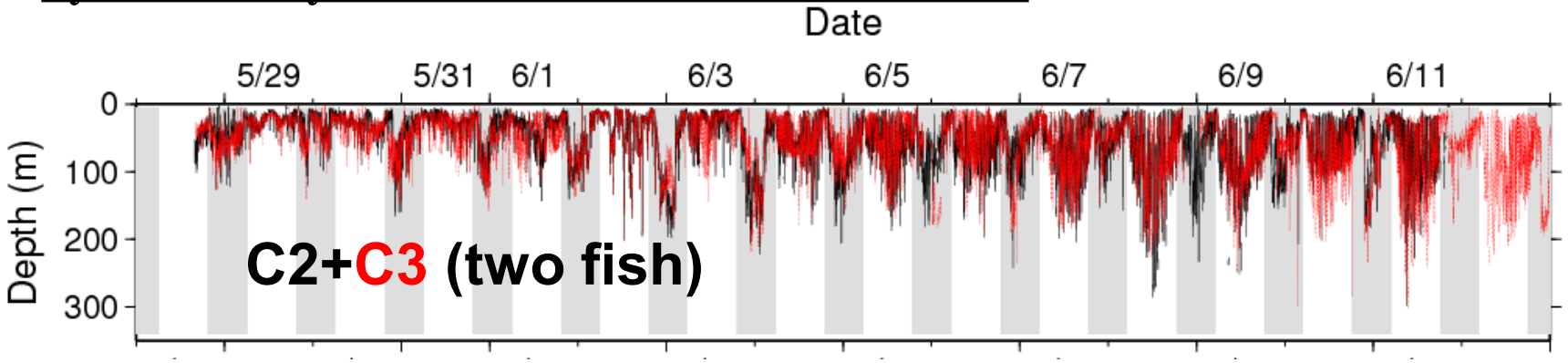


Pinger



Association with the FADs and vertical movement based on pinger

Synchronicity of vertical movement for two fish



Time series association of the fish with the FADs